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11

By GEORGE W. TRYON, Jr.

CONTINUATION BY

HENRY A. PILSBRY,

CONSERVATOR OF THE CONCHOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

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Genus BULIMULUS Leach (Continued).

DIVISION II. *Bulimuli with the nepionic whorls sculptured with waved, zig-zag or irregular subvertical wrinkles, or with the wrinkles dislocated and broken more or less into granules or a netted pattern.*

This group, the second of three defined on p. 127, Volume X of this work, is characteristic of tropical and temperate South America, but numerously represented in Central America, with species extending as far north as Yucatan and Vera Cruz, and also in the West Indian Islands, where it is mainly developed in the Carribean chain.

Aside from the above-mentioned features of the antenatal shell, there are no definite shell characters special to the group holding throughout its several members. The peristome, while generally simple, is in some forms expanded or reflexed; and one-colored, banded and elaborately spotted species occur. In one rather numerous group of species the apical sculpture is extremely shallow and often hardly perceptible in adult specimens.

Four subgenera are distinguishable, although only the first of them stands conspicuously apart.

1. Subgenus PLECTOSTYLUS Beck. Shell imperforate, ovate or oblong, somewhat Succinea-shaped; aperture ovate, large, the peristome simple and unexpanded, columella with a long fold or concave. Generally conspicuously speckled or streaked. Distribution, Chili and Peru, along the Pacific. (Page 2.).

2. Subgenus SCUTALUS Albers. Shell perforate or umbilicate, ovate-conic; aperture ovate, the peristome either expanded, thickened, or simple. Columella not distinctly folded, its edge reflexed; mainly opaque and rather solid shells, with banded, streaked or spotted coloration. Distribution, Andean plateau, from Argentina to Ecuador. (Page 12.).

3. Subgenus BULIMULUS Leach. Shell perforate or umbilicate, ovate-conic or oblong, the aperture ovate, peristome thin and simple, or (rarely) thickened within or slightly expanded. Columellar lip reflexed. Mainly rather thin shells of corneous texture, a minimum amount of lime, and brown or few-banded coloring. Distribution, Central America, northern and eastern South America, and the West Indies. (Page 35.).

4. Subgenus RHINUS Albers. Shell umbilicate, ovate or oblong, thin or solid, the peristome narrowly expanded or reflexed,

surface bearing spiral series of short bristles. Brown or corneous shells with unicolored or few-banded coloration. Distribution, Brazil. (Page . . .).

Subgenus Plectostylus Beck, 1837.

Plectostylus Beck, Index Molluscorum, p. 58.—Gray, P. Z. S., 1847, p. 176, type *B. peruvianus.* Not *Plectostylus* Conrad, 1842, see Proc. U. S. Nat. Mus., 1883, p. 184.

Imperforate, ovate or oblong, rather thin Bulimuli with the apex small and conic, nepionic whorls minutely wave-striolate or vermiculate-granose, the lip simple and unexpanded, columella with a long fold or concave; generally much speckled or streaked. Type *B. peruvianus.*

Almost exclusively a group of the Chilian sea-board, but at least one species extends into Peru. The distribution is thus contrasted with that of *Scutalus,* which is mainly confined to the Andean plateau.

Plectostylus is allied to *Scutalus,* but differs in the simpler, more Succinea-like form, long aperture and unexpanded, thin outer lip. The species may be tabulated as follows.

Key to species of Plectostylus.

A. Upper termination of the outer lip produced across the whorl as far as the greatest ventral convexity (see pl. 6, f. 90); surface spirally striated.

a. Ventricose, the altitude less than double the diameter; boldly marked with "burnt" chestnut; aperture very oblique, *coturnix.*

aa. Ventricose, altitude less than double the diameter; whitish, densely spotted, tesselated, or irregularly variegated, *broderipii, buschii.*

aaa. Slender, altitude about double the diameter; yellow, with oblong spots in girdles, or streaks, *variegatus, moestai.*

B. Upper termination of outer lip not produced, a profile view showing the ventral convexity of body-whorl extending conspicuously beyond it.

b. Coarsely plicate or wrinkled, without spiral striæ; columella twisted, and with the parietal wall, purplish, *peruvianus.*

bb. Longitudinal sculpture fine; columella white,

c. Conspicuously granulose throughout; yellowish, with narrow, distant brown streaks; columella folded, *chilensis.*

cc. Slender, with delicate or subobsolete granulation; streaked, but with a defined unicolored baso-columellar tract; alt. about 36 mill., *reflexus.*

ccc. Smaller than *reflexus*, with much the same sculpture and color, *ochsenii.*

cccc. Much speckled; granulose below sutures, *coquimbensis.*

ccccc. Striped alternate white and corneous, with brown longitudinal lines and interrupted basal spirals; smooth, *perelegans.*

B. COTURNIX (Sowerby). Pl. 6, figs. 89, 90, 91, 92.

Shell imperforate or nearly so, *ovate*, rather solid. Whitish, with *spiral series of chestnut-brown blotches, often wedge-shaped, triangular, or otherwise peculiar in form*, and on the last whorl of adults generally more or less coalescent longitudinally. Surface smoothish, showing under the lens rather low growth-wrinkles and excessively fine, unequal, close spiral striæ, rendering it granulose above. Spire conic, the apex somewhat obtuse, vermiculate-granose; sutures superficial, the last more rapidly descending and deflexed in front. Whorls 5, weakly convex. *Aperture very oblique*, rather large-ovate, white within and more or less distinctly showing the bands; peristome not expanded, obtuse, the outer lip somewhat thickened with, in, strongly arcuate above; *columella concave* (straight in the young), *not folded*, dilated and appressed above, leaving a slight umbilical chink. Alt. 35, diam. 20 mill., sometimes smaller.

Chili: Huasco (Cuming, Orb., Paz, Martinez), among rocks.

Bulinus coturnix SOWB., P. Z. S., 1832, p. 30; Conch. Illustr., f. 3 (not good).—*Helix coturnix* ORB., Mag. de Zool., 1835, p. 7.—*Bulimus coturnix* DESH. in Lam., An. s. Vert., viii, p. 264; and in Fér. Hist., p. 93, pl. 150, f. 3, 4.—ORB., Voy., p. 266.—REEVE, Conch. Icon., pl. 19, f. 115.—PFR., Conchyl. Cab., p. 215, pl. 60, f.

24, 25 (young shell); Monogr., ii, p. 150; iii, 384; iv, 450; vi, 90; viii, 126.—HUPE in Gay, Hist. de Chile, viii, p. 102, pl. 1, f. 4, 4a, 4b.—HIDALGO, Viaje al Pacif., p. 115.—*Buliminus coturnix* BECK, Index, p. 69.

A solid, ventricose species, with very oblique aperture and peculiar coloration. The markings are of a "burnt chestnut" as Reeve aptly says. The young shells, which are commoner in collections than the adults, are rather thin, but still readily separable from young *broderipii* by the shorter, more obese form and straight columella. The periphery is subangular in quite young examples (fig. 91, 92). Figs. 89 and 90 are drawn from the largest specimen I have seen.

B. BRODERIPII (Sowerby). Pl. 6, figs. 79, 80, 81, 82, 83.

Shell imperforate, ovate, *thin* and rather fragile. Very pale buff or *white, with numerous spiral girdles of squarish or irregular black-brown spots* and (typically) rounded dots, this pattern often much obscured by the running together of the spots to form vermiculate figures or streaks, and the more general dispersion of dots. Surface smoothish, superficially wrinkle-striate, cut by spirals into revolving series of granules with very delicate spiral striation between them; apex with very delicate waved vertical riblets. Spire conic, the apex rather projecting, white; whorls 5-5½, the earlier 2 convex, not variegated, the rest very weakly convex; last whorl distinctly flattened above.

Aperture quite oblique, ovate, with distinct color-pattern within; outer lip unexpanded, straightened above, columella concave, forming a long spiral, its edge reflexed in a very thin appressed callus.

Alt. 45, diam. 28 mill.; alt. of aperture 30 mill.

Alt. 46, diam. 26 mill.; alt. of aperture 27½ mill.

Alt. 33, diam. 21 mill.; alt. of aperture 20 mill.

Alt. 24, diam. 13 mill.

Chili: *Copiapo and Cobija* (Orb.); *Huasco* (Martinez); *Paposo* (Paz); *Iquiqui, Peru* (Cuming).

Bulinus broderipii SOWB., P. Z. S., 1832, p. 50; Conch. Illustr., f. 1, 1*, 1**.—*Bulimus broderipii* DESH. in Lam., An. s. Vert., viii, p. 263.—ORB., Voy., p. 266.—REEVE, Conch. Icon., pl. 16, f. 97.—PFR., Monogr., ii, p. 146; Conchyl. Cab., p. 213, pl. 60, f. 20, 21.—GAY, Hist. Chile Zool., viii, p. 101, Atlas, pl. 2, f. 2.—HIDALGO, Viaje al Pacif., p. 117.—*Helix broderipii* ORB., Mag. de Zool., 1835,

p. 7.—*Succinea broderipii* Pfr., Symbolæ, ii, p. 131.—*Plectostylus broderipii* Beck, Index, p. 58.

It is more ventricose than any allied species except *B. coturnix*, which is more solid, with straighter columella.

The large, typical form is reported by Cuming from Copiapo; the smaller tessellated form from Iquiqui. Paposo specimens are also small. Besides the large, richly variegated shells and the small tessellated form figured, there are many of intermediate size before me, with only small spots and rather faint, closely scattered dots. In some of these, and in small specimens generally, the sculpture is not typically developed. Some geographic races of *B. broderipii* will no doubt be recognized eventually.

B. buschii (Pfeiffer). Pl. 6, figs. 84, 85.

Shell imperforate, ovate-acuminate, very minutely granulated, pellucid. Tawny-buff, longitudinally painted with irregular streaks and flames; spire papillar at the apex; whorls 5, rather flat, the last double the length of the spire. Aperture oval-oblong; peristome simple and acute, the columellar margin somewhat thickened and a little reflexed. Alt. 24, diam. 15 mill. (*Pfr.*).

Habitat unknown (coll. v. d. Busch).

Succinea buschii Pfr., Symbolæ, ii, p. 56.—*Bulimus buschii* Pfr., Symb., iii, p. 53; Monogr., ii, p. 148; Conchyl. Cab., p. 216, pl. 60, f. 22, 23.

This looks like a small streaked *B. broderipii.* I have not seen specimens.

B. variegatus (Pfeiffer). Pl. 6, figs. 86, 87, 88.

Shell imperforate, oblong-ovate, rather solid though not thick. *Straw-yellow, marked with numerous unequal girdles of long chestnut spots* (or in other words, obliquely streaked with chestnut, the streaks cut by numerous unequally spaced girdles of the ground-color); sometimes with irregular streaks and dots as in *B. broderipii*, see fig. 88. Surface smooth to the naked eye, but *under the lens showing irregular growth-wrinkles and very close, fine, undulating and minutely granose spiral striæ over the whole surface.* Spire rather long and straightly conic, the apex rather acute, apical whorls with most minute, close, waved and anastomosing oblique striæ. Whorls 5 or slightly more, regularly increasing, nearly flat, separated by a shallow weakly denticulate suture; last whorl long.

Aperture quite oblique, over half the alt. of shell, within white and marked like the outside; peristome simple, the upper termination of the outer lip extending far over the whorl. Columella concave below, nearly straight above, white, its thin edge reflexed and appressed.

Alt. 44, diam. 22 mill.

Alt. 37, diam. 19 mill.

Valleys north of Coquimbo, Chili (Bridges).

Succinea variegata PFR., P. Z. S., 1842, p. 187; Symbolæ, ii, p. 56.—*Bulimus variegatus* PFR., Zeitschr. f. Mal., 1844, p. 184; Monogr., ii, p. 146; Conchyl. Cab., p. 213, pl. 60, f. 3, 4.—HUPE in Gay, Hist. Chile, viii, p. 102, pl. 3, f. 1, 1a.—*Bulimus rupicolus* REEVE, Conch. Icon., pl. 16, f. 93 (1848).

Although rather slender in contour, like *B. reflexus, coquimbensis* and *perelegans*, the *B. variegatus* is more allied to *B. broderipii* and *coturnix* in having the upper termination of the outer lip produced as far forward across the whorl as the greatest convexity of the ventral surface of the shell. This is not the case with *B. coquimbensis* and its allies, nor with *B. chilensis*, which, moreover, is more coarsely granulose.

Aside from these considerations of contour, which are perfectly diagnostic, *B. variegatus* seems intermediate between *reflexus* and *broderipii* in color-pattern, but is yellower than either. The close relationship with *B. broderipii* is also attested by certain shells which depart from the normal pattern and assume much the same vermiculate blotches and scattered dots of certain forms of *broderipii*, while retaining the yellow ground-color and slenderer form of *variegatus*.

B. MOESTAI (Dunker). *Unfigured.*

Shell covered subrimate, ovate-conic, rather thin, having delicate costulæ, granulose throughout; buff, under a corneous, little shining cuticle, marked with irregular chestnut streaks. Whorls 6, a little convex, separated by a distinct suture; spire a little convexly conic, the apex obtuse; columella white, nearly straight. Aperture oval; peristome simple. Alt. 30, diam. 15 mill.; aperture 14½ mill. long, 8 wide (*Dkr.*).

Cerro Bravo, valley of Copiapo, Chili (F. Moesta).

Bulimus moestai DKR., Malak. Bl., xi, 1864, p. 156.—PFR., Monogr., vi, p. 90.

Very like *B. ochsenii* Dkr., differing in the umbilical chink, distinct granules, non-papillose suture, smaller proportionate size of the aperture, more obtuse apex, stronger columella and narrower aperture. (*Dkr.*).

B. PERUVIANUS (Bruguiére). Pl. 7, figs. 96, 97, 98, 99.

Shell imperforate, oblong, rather solid; white, unicolored, irregularly stained or clouded, or with several wide purple-brown bands or longitudinal streaks under a yellow cuticle usually more persistent in numerous spiral lines; *sculptured with coarse irregular longitudinal whitish wrinkles*, and usually having many narrow spiral bands composed of fine vertical wrinkles or pits, the apical whorls with dense and very fine undulating striæ. Spire short, convex-conic, rather acute; suture irregularly denticulate. Whorls 5½, *at first slowly and then rapidly descending*, the latter 2 convex.

Aperture long, acuminate-ovate, purple-rose and white within sometimes dark-maculated; peristome slightly thickened inside, not expanded; *columella with a conspicuous cord-like, spirally entering convex fold above*, its margin reflexed and appressed; *parietal wall with a thin rose-purple callus.*

Alt. 45, diam. 22 mill.; aperture 26 mill. long.

Alt. 42, diam. 20 mill.; aperture 22 mill. long.

Chili: Concepcion, Quillota (King); *Valparaiso* (Orb., Paz and Martinez).

Bulimus peruvianus BRUG., Encycl. Méth., i, p. 320.—GRAY, Spicil. Zool., pl. 5, f. 4.—ORB., Voy., p. 267.—HOMBRON & JACQ., Voy. au Pol Sud, v, p. 30, pl. 8, f. 2.—PFR., Monogr., ii, p. 166.—DESH. in Fér., Hist., ii, (2), p. 75, pl. 114, f. 1–4.—REEVE, Icon., pl. 17, f. 101.—HIDALGO, Viaje al Pacif., p. 102.—HUPE, in Gay, Hist. Chile, p. 100, pl. 1, f. 2.—*Helix* (*Cochlostyla*) *peruviana* FER., Prodr. no. 334.—*Plectostylus peruvianus* BECK, Index, p. 58.—FFLD., Verh. Zool.-bot. Ges. Wien, xix, 1869, p. 875.—BINNEY, Ann. N. Y. Acad., iii, p. 124, pl. 12, f. J (dentition).—*Bulinus corrugatus* KING, Zool. Journ., v, p. 341.—*Bulinus gravesii* KING, Zool. Journ., v, p. 340.—SOWB., Conch. Illustr., f. 12, 12*, 12**.—? *Plectostylus pulicarius* BECK, Index, p. 58 (incorrect reference to Gray's Sp. Zool.? Referred by Pfr. to *Bul. piperitus*, in Nomencl. Hel. Viv., p. 227).

Variable to an unusual degree in coloring, contour and sculpture. Some specimens have three wide interrupted purplish bands; others

are longitudinally streaked with the same color, or irregularly clouded; while many specimens are clear yellowish or light brown, usually showing narrow spirals of a darker tint. There is no other species very nearly allied to this.

B. peruvianus is said to be viviparous. The name is unfortunate, as the species is not known to occur in Peru.

B. CHILENSIS (Lesson). Pl. 7, figs. 8, 9, 10.

Shell imperforate, ovate-oblong, thin but rather strong, *buff or pale chestnut, with narrow longitudinal streaks of brown. Surface with dense and fine irregular striæ, cut into fine granules throughout.* Spire short, conic, rather acute; sutures minutely denticulate. Whorls 5½, slightly convex, the last oblong.

Aperture about half the total length, acuminate-ovate, white or streaked inside; peristome acute, unexpanded; columella with a weakly convex entering fold above, the columellar margin reflexed and appressed; parietal callus thin and transparent.

Alt. 42, diam. 21 mill.; aperture 22 mill. long.

Alt. 38, diam. 18 mill.; aperture 20 mill. long.

Form *aldunatea* Hupé (pl. 7, figs. 6, 7). Shell with three distinct spiral bands of brown.

Chili, from Concepcion (Cuming, Orb., Gay); *to Valparaiso* (Cuming, Orb., Paz, Martinez).

Bulimus chilensis LESSON, Voy. de la 'Coquille,' Zool., Atlas, Moll., pl. 7, f. 3 (1826). Not *Bulinus chilensis* Sowb., 1833, see Vol. X, p. 34.—*Achatina chiliensis* LESSON, Voy. de la 'Coquille,' ii, pt. 1, p. 317 (1830).—*Bulimus chilensis* DESH. in Lam., An. s. Vert., viii, p. 264.—ORB., Voy., p. 267.—REEVE, Conch. Icon., pl. 17, f. 102.—GLD., U. S. Expl. Exped. Moll., p. 79, pl. 6, f. 81.—HUPE in GAY, Hist. de Chile, viii, p. 99, pl. 1, f. 1a–1d.—PFR., Monogr., ii, p. 167; iii, 406; iv, 466; vi, 105; viii, 142.—HIDALGO, Viaje al Pacif., p. 103.—*Plectostylus chilensis* FFLD., Verh. Zool.-bot. Ges. Wien, xix, 1869, p. 875.—*Bulimus* (*Plectostylus*) *chilensis* SEMPER, Reisen im Archipel Phil., Landmoll., iii, p. 153, pl. 15, f. 6; pl. 17, f. 12 (anatomy).—*Bulimus granulosus* POT. & MICH., Galerie, i, p. 142, pl. 13, f. 9, 10.—*Bulinus granulosus* BROD., P. Z. S., 1832, p. 31.—SOWB., Conch. Illustr., f. 7, 7*.—*Bulimulus granifer* BECK, Index, p. 67.—*Helix* (*Bulimus*) *aldunatea* HUPE in Gay, Hist. Chile, viii, p. 100, pl. 1, f. 6 (as var. of *chilensis*).—*Partula flavescens* KING, Zool. Journ., v. p. 342, (1831).—*Bulimus flavescens* PFR., Monogr., ii, p. 75 (copy of orig. descr.).

In contour *B. chilensis* is much like *B. peruvianus*, but it is far smoother, finely granulose, with less twisted columella and different color-scheme. It is oviparous.

The locality, "Ilo, Peru," given for this species in d'Orbigny's Prodrome and repeated by Pfeiffer, was evidently an error, as he does not mention it in the "Voyage," and the place lies far to the north of the known range of the species. *Partula flavescens* King was apparently based upon the young of this species.

B. REFLEXUS (Pfeiffer). Pl. 6, figs. 93, 94, 95.

Shell imperforate, *thin*, fusiform-ovate; *yellowish corneous with obliquely longitudinal streaks of white and narrow, spaced chestnut streaks*, sometimes interrupted into girdle of narrow vertical lines, or occasionally accompanied by dots on the white streaks, all dark marking abruptly discontinued below, *the baso-columellar tract light, not streaked. Surface smooth and shining to the eye, but under the lens showing a delicate granulation* produced by fine growth-wrinkles crossed by most minute, irregular and partly obsolete spiral striæ; the apical whorls sculptured with minute, close, zigzag-waved longitudinal striæ. Spire long-conic; whorls 5, very feebly convex, the latter half of the last suture descending obliquely to the others.

Aperture long-ovate, somewhat oblique, marked within; peristome thin and simple; columella concave below, straightened above, its edge reflexed and appressed.

Alt. 36½, diam. 16 mill.; alt. of aperture 19 mill.

Alt. 37, diam. 14¾ mill.; alt. of aperture 18 mill.

Pichidanque, near Coquimbo, Chili, on leaves of *Puya coarctata* (Bridges).

Succinea reflexa PFR., P. Z. S., 1842, p. 187; Symbolæ, ii, p. 56. —*Bulimus reflexus* PFR., Symbolæ, iii, p. 56; Monogr., ii, 147; Conchyl. Cab., p. 215, pl. 60, f. 9, 10.—REEVE, Conch. Icon., pl. 85, f. 628 (1850).—GAY, Hist. de Chile, viii, p. 105, pl. 1, f. 3, 3a.

A delicate form of the *B. chilensis* group, which Bridges found living on the leaves of a Bromeliaceous herb. It differs from *chilensis* in the thinner texture, more delicate granulation, slender contour and the pattern of coloration. In *B. chilensis* the dark streaks when present are not abruptly discontinued at the base, leaving a circum-columellar clear area such as seems invariable in this species.

B. perelegans is a smoother shell, with more white strigation and without the immaculate baso-columellar tract of *reflexus*.

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B. OCHSENII (Dunker). Pl. 8, figs. 28, 29.

Shell imperforate, ovate-conic, thin, striatulate and under the lens very lightly granulate-decussate. Buff, ornamented with narrow dark streaks and sometimes chestnut spots. Spire a little convexly conic, the apex subacute; suture very delicately denticulate. Whorls 5, slightly convex, the last somewhat attenuated below.

Aperture oblique, acuminate-oval, a little longer than the spire; peristome simple, unexpanded, chestnut edged; columella white above, receding, thread-like. Alt. 25½, diam. 12 mill.; aperture 15 mill. long, 7 wide. (*Pfr.*).

Province of Valdivia, Chili (W. Ochsenius); *Santiago de Chile* (Paz).

Bulimus ochsenii DUNKER, Malak. Bl., ii, 1855, p. 107.—PFR., Monogr., iv, p. 449.—HIDALGO, Journ. de Conch., 1870, p. 55; 1875, p. 128, pl. 7, f. 2.—*Bulimus arbustorum* PHIL. *in litteris.*

A smaller shell than *B. reflexus*, but so far as the published description and figures go, offering no other distinctive characters unless *ochsenii* proves to have no streakless columellar tract.

B. COQUIMBENSIS (Broderip). Pl. 8, figs. 14, 15, 16, 17.

Shell imperforate, ovate or oblong-ovate, rather thin. *Whitish, closely speckled throughout with chocolate-brown dots and small blotches.* Surface smoothish, under the lens showing *irregular growth-wrinkles* and very superficial, subobsolete spiral striæ, which become stronger toward the upper part of the whorls, producing a distinct and *irregular granulation* below the sutures. Spire conic, the apical whorls showing a very superficial vermiculate or netted pattern. Whorls 5 to 5½, weakly convex.

Aperture somewhat oblique, slightly or much exceeding half the shell's length, variegated within; peristome thin, simple; columella concave below, with a long, feebly spiral fold above.

Alt. 40, diam. 19 mill.; alt. of aperture 21 mill.

Alt. 38, diam. 20 mill.; alt. of aperture 24 mill.

Coquimbo, Chili (Cuming, Paz and Martinez).

Bulinus coquimbensis BROD., P. Z. S., 1832, p. 30.—SOWB., Conch. Illustr., f. 8.—*Helix coquimbensis* ORB., 1835.—*Plectostylus coquimbensis* BECK, Index, p. 58.—*Bulimus coquimbensis* DESH. in Lam., viii, p. 264; and in Fér., Hist., pl. 139, f. 8-10.—POT & MICH., Galerie, i, p. 136, pl. 12, f. 15, 16.—ORB., Voy., p. 267.—PFR., Monogr., ii, p. 147; Conchyl. Cab., p. 212, pl. 60, f. 1, 2.—REEVE,

C. Icon., pl. 16, f. 95.—Gay, Hist. de Chile, viii, p. 103, pl. 2, f. 3. —Hidalgo, Journ. de Conch., 1870, p. 59; Viaje al Pacifico, p. 116.—*Succinea coquimbensis* Pfr., Symbolæ, ii, p. 131.

While some forms of this species resemble *B. perelegans* in coloring, still *coquimbensis* is a species of coarser texture, and in the average, more speckled coloration; moreover, it is more granulated below the sutures, or shows spiral girdles of longitudinal puckers there, while the other species is smooth. The contour varies in wide limits, as may be seen by the measurements given above; so that while typical examples of *coquimbensis* and *perelegans* are readily distinguished, there are other specimens hardly separable except by attention to the slight sculptural features above noted.

Var. perelegans Pilsbry, n. n. Pl. 8, figs. 18, 19, 20, 21, 22.

Shell imperforate, oblong-ovate, *thin. Corneous, closely striped longitudinally with opaque white, and having narrow interrupted streaks or longitudinal lines of brown;* showing more or less tendency to form *narrow interrupted spiral girdles, at least toward the base.* Surface glossy, with low, irregular and inconspicuous growth-wrinkles; *lacking spiral striation and not granulated.* Whorls 5, but feebly convex, the last somewhat obliquely descending. Apical sculpture an excessively faint and superficial minute net-work on a glossy surface.

Aperture decidedly over half the alt. of shell, long-ovate, subvertical, inside colored like the exterior except that buff replaces the white; outer lip thin and simple; columella very thin, concave below, with a slight fold above, its edge reversed and appressed.

Alt. 34, diam. 17 mill.

Alt. 29, diam. 16 mill.

Near Huasco, Chili (Bridges, Gay).

Succinea elegans Pfr., P. Z. S., 1842, p. 187; Symb., ii, p. 56. Not *Succinea elegans* Risso, 1826.—*Bulimus elegans* Pfr., Symbolæ, iii, p. 54; Monographia, ii, p. 148; vi, 89; Conchyl. Cab., p. 214, pl. 60, f. 7, 8.—Gay, Hist. de Chile, viii, p. 104, pl. 3, f. 2.—Reeve, Conch. Icon., pl. 19, f. 112.

Not granulated below the sutures as *B. coquimbensis* is, and smaller, more fragile, with less oblique aperture and livelier, less dotted coloration; but still an almost complete series of intermediate forms exists among the numerous examples of the two before me, so that I hesitate to give this form specific rank. Reeve's figure repre-

sents an obese specimen, while those of Pfeiffer and Gay are more normal, but both stout and slender specimens are represented in one of the trays before me.

Subgenus SCUTALUS Albers, 1850.

Scutalus ALBERS, Die Hel., 1850, p. 160.—ALB.-MART., Die Hel. 1860, p. 217, type *B. proteus.*

Ovate-conic, mostly perforate or umbilicate Bulimuli, with the nepionic whorls striolate or densely pitted, aperture ovate with the lip often expanded or thickened; columella not distinctly folded, its edge dilated and reflexed. Type *B. proteus.*

A group of rather solid species, mainly developed upon the Andean plateau of Ecuador, Peru and Bolivia, but extending to the south as far as north-western Argentina. It is essentially an Andean type, the allied section *Plectostylus* replacing it in Chili and the typical *Bulimulus* and *Leptomerus* occupying the regions to the eastward and north-east.

I do not know of any terrestrial snails living at greater altitudes than some of the members of this subgenus. *B. culmineus*, a species of the Bolivian and Peruvian Andes in the neighborhood of Lake Titicaca, ascends to 5,000 meters (over 16,500 ft.) above sea level. *B. anthisanensis*, an Ecuador snail, lives at 4,200 meters (14,000 ft.); and *B. caliginosus* and a few other forms from the same region, have been found at an equal height.

Scutalus as here understood differs widely in limits from the assemblage of species grouped under the same name in Die Heliceen and Nomenclator Heliceorum. The recognition of sculptural characters of the nepionic stage as diagnostic of subgeneric groups, necessitates the removal of species with smooth and those with costellate apices, which were formerly included in *Scutalus.* By this elimination, the group becomes restricted geographically to a definitely limited though extensive region wherein like physical conditions prevail. *Scutalus* in its former limits included species diverse in characters of the antenatal shell, distributed over all of western and northern South America, Mexico and the southern United States, in regions more or less like physically, but widely different in most of their faunal factors.

Group of B. proteus.

This is the west Peru type of *Scutalus*, characterized by the more or less strongly granose surface, frequently banded and much

variegated coloration, expanded lip and generally rather large umbilicus. The *proteus* group is geographically isolated from other groups of *Scutalus*, and differs appreciably in conchological features.

B. PROTEUS (Broderip). Pl. 1, figs. 1, 2, 4, 5.

Shell broadly umbilicate or rimate, ovate-conic, rather solid or thin; in color either (*a*) uniform dirty white or buff; (*b*) whitish with about 6 spiral brown bands, sometimes the four median coalescent into two wide girdles; (*c*) yellowish-brown or purple-brown, spotted and obliquely streaked with buff or whitish. *Surface densely granulose* by the intersection of close oblique wrinkles by impressed spirals; this sculpture sometimes very strong, sometimes weak; *embryonic whorls very minutely densely pitted and vertically grooved.* Spire conic, the apex obtuse. Whorls 5½ to 6½, slightly convex, the last weakly convex above, but full and convexly rounded below and basally.

Aperture hardly oblique, carried forward to the ventral level of the body-whorl, white or variegated inside; peristome well expanded, flaring, the margins approaching, connected by a parietal callus; the columellar margin having a deep-seated oblique fold.

Alt. 52, diam. 32 mill.

Alt. 33, diam. 19 mill.

Peru, at Truxillo, St. Jacinta, near Samanco, and Pacosmayo (Cuming); *Lima* (Paz); *Pachacamac* (Isern); *Tarma* (Jelski); *Chota* (Stolzmann); *Chili* (Dr. Ruschenberger!); "*Campana de Quillota*" (Couthouy). Under and among stones.

Bulinus proteus BROD., P. Z. S., 1832, p. 107.—SOWB., Conchol. Illustr., f. 14, b, c.—*Bulimus proteus* ORB., Voy., p. 307.—DESH. in Fér., Hist., p. 68, pl. 139, f. 1–3.—GLD., U. S. Expl. Exped. Moll., p. 78, f. 76.—PFR., Monogr., ii, p. 61; vi, p. 42.—HIDALGO, Mol. Viaje al Pacif., p. 109; Journ. de Conchyl., 1870, p. 55.—LUBOMIRSKI, P. Z. S., 1879, p. 724.—DALL, Nautilus, vii, p. 26.—*Bulimus sordidus* DESH. in Lam., An. s. Vert., viii, p. 267.—REEVE, Conch. Icon., pl. 17, f. 100c. Not *B. sordidus* Less. Not *B. proteus* of writers on Lower Californian mollusks. Not *B. proteus* 'Guilding' Swainson, Malacol., p. 335, a nude name.

Very similar to the Lower Californian *B. montezuma* Dall, but the body-whorl is more convex and less produced below, the latter half-turn of the suture descends less, and the extremely fine pitting and wrinkling of the apical whorls is very unlike the straight riblets of the Lower Californian species.

B. proteus varies wonderfully in size, degree of coarseness of the granulation, and coloring. Specimens intergrading with *B. mutabilis* will probably occur, but in examining extensive series of each, I have not found completely intermediate forms.

B. MUTABILIS (Broderip). Pl. 1, figs. 6, 8, 9, 10, 3.

Shell ovate-turrited, with open umbilicus, moderately solid or rather thin; *densely granulated* by spiral impressed striæ cutting close strong and rather irregular growth-wrinkles. Whitish or yellowish, with (*a*) six spiral brown bands, or (*b*) irregular brown oblique streaks, or (*c*) spotted and streaked with umber brown in elegant pattern, and with a light girdle below the periphery. Whorls 6 to 6½, rather convex; apex obtuse, the earlier whorls densely punctate in criss cross pattern, vertically striolate below.

Aperture about half the length of shell, nearly vertical; outer lip thin, flaring; columella reflexed; parietal callus slight.

Alt. 31½, diam. 17 mill.

Alt. 32½, diam. 15 mill.

Alt. 27, diam. 15½ mill.

Peru, at Truxillo and Santos (Cuming); *Lima* (Paz). Under stones.

Bulinus mutabilis BROD., P. Z. S., 1832, p. 108.—SOWB., Conch. Ill., f. 15*.—*Bulimus mutabilis* PFR., Conchyl. Cab., p. 257, pl. 70, f. 1–4; Monogr., ii, p. 62.—HIDALGO, Journ. de Conchyl., 1870, p. 47.—*B. sordidus* REEVE (not Lesson), pl. 17, f. 100b (and 100a?).

Very closely allied to *B. proteus*, but it is smaller, more slender, with longer and slimmer spire, and the aperture is smaller in proportion. Reeve unites the two; and it is not unlikely that *mutabilis* should take subspecific rather than specific rank.

B. PROTEIFORMIS Dohrn.

Shell profoundly rimate, ovate-conic, solid, irregularly striated, white. Spire conic. Whorls 5 to 6, rather flat, the last more or less inflated, compressed around the umbilicus, ascending in front. Aperture vertical, acuminate-ovate, brown, unicolored or white-banded inside; peristome broadly expanded, acute, the margins joined by a callus, columellar margin wide, flat. (*Dohrn*).

Alt. 54, diam. 23; alt. of aperture 30, width 20 mill.

Alt. 50, diam. 25; alt. of aperture 30, width 21 mill.

Alt. 48, diam. 22; alt. of aperture 27, width 15 mill.

Alt. 42, diam. 21 ; alt. of aperture 23, width 15 mill.

Peru

Bulimulus proteiformis Dohrn, Malak. Bl., x, 1863, p. 154.—Pfr., Monogr., vi, p. 42.—Semper, Reisen im Phil. Archip., Landmoll., p. 152, pl. 15, f. 7 ; pl. 17, f. 5.

The measurements of other specimens vary between the dimensions given above, scarcely two being of the same size. There is great similarity with *B. proteus*, the differences consisting in the thick, chalky shell, the dark brown aperture, the inconspicuous sculpture, granulation being confined to the last whorl. The upper whorls are always eroded smooth so that sometimes the brown color of the interior shows through.

The above details are from Dohrn. I have not seen the species, and it has not been figured.

B. coraformis Pilsbry, n. sp. Pl. 30, figs. 10, 11, 12, 13.

Shell deeply umbilicated with *a long tangential lunate rimation*, ovate-pyramidal, solid, dull whitish. Surface lusterless, with close, irregular growth-wrinkles *cut into oblong granules* by spiral incised striæ. Spire turrited, the apex obtuse, nepionic 1⅔ whorls densely pitted (fig. 10); whorls 7, moderately convex, the latter third of the last slowly but decidedly ascending, *umbilical region broadly excavated* behind the columellar lip.

Aperture ovate, vertical, its plane level with the ventral convexity of last whorl, *purplish-brown inside* but white in the throat; *peristome broadly expanded*, bell-shaped, *purple-brown, fading to whitish at the edge;* the extremities approaching and connected by a short, white parietal callus; columella purple-brown, arcuate, very broadly built forward and expanded, white-edged.

Alt. 37½, diam. 25 mill.; alt. of aperture 20 mill; greatest width 14 mill.

Peru, on the Maranon (U. S. Nat. Mus.)

The granulation is visible to the naked eye, although minute, and is developed on all of the post-nepionic whorls, but faint on the first one.

The species has much in common with *B. cora* d'Orbigny, but the umbilical excavation is far wider, the central perforation much broader, the lip margins more approaching, and the earlier whorls of the spire not keeled. In *B. cora* and the other *Neopetræus* species of similar form, the earlier post-nepionic whorls are acutely

keeled, the keel filling the suture. The granulation is decidedly finer than in *B. proteus*, but the apical sculpture is the same as in that species. In *B. proteiformis* the aperture is larger in proportion to the shell, the form is much more slender and the sculpture different. *B. rhodolarynx* Reeve has the aperture much more rounded and the umbilical excavation smaller.

This shell is from the country of the similarly shaped *Neopetræus* species, but it differs totally from them in the sculpture of the apical whorls, which is like that of *B. proteus*.

The type is No. 104877, U. S. National Museum (Lea collection).

B. VERSICOLOR (Broderip). Pl. 1, figs. 7, 11, 12, 13, 14.

Shell ovate-turrited, umbilicate, rather thin. Whitish marked with brown in various patterns: (*a*) five-banded, the bands much interrupted and spotted, a narrow one below suture, a very broad band extending nearly to periphery, followed by a narrow girdle between two white bands, below which is a wider basal band and an umbilical crescent; (*b*) irregular longitudinal stripes, continuous or anastomosing, without light spiral bands, and often coarsely mottled with opaque white. *Surface apparently smooth*, but under the lens seen to be decussated and weakly granose.

Aperture about half the length of shell, as vividly colored as the outside; peristome well expanded, the parietal callus thin.

Alt. 25–27, diam. 14 mill.

Peru, Mongon, near Casma, found on bushes (Cuming); *Truxillo* (Jelski); *Lima*, among rocks (Paz and Martinez); *Santos* (Beechey).

Bulinus versicolor BROD., P. Z. S., 1832, p. 108.—SOWB., Conch. Illustr., f. 16, 16*.—*Bulimus versicolor* DESH. in An. s. Vert., viii, p. 268; in Fér., Hist., p. 70, pl. 139, f. 13, 14, 17–19.—REEVE, Conch. Icon., pl. 19, f. 113.—PFR. in Conchyl. Cab., p. 258, pl. 70, f. 5, 6; Monogr., ii, p. 61.—HIDALGO, Viaje al Pacif., Mol., p. 110.—LUBOMIRSKI, P. Z. S., 1879, p. 724.—*Helix versicolor* ORB. not Born.—*Bulinus mutabilis* SOWB., Conch. Illustr., f. 15; Zool. Beechey's Voy., p. 145, pl. 38, f. 20.—*Bulimus varians* Sowb., KUSTER, Conchyl. Cab., p. 41, pl. 13, f. 3, 4.

Much like *B. mutabilis* in form, but smoother, and not having the same color patterns.

Var. CALLAOENSIS Pilsbry, n. v. Pl. 1, fig. 15.

Solid and heavy, obliquely streaked and with transverse mottling of gray on a whitish ground. Alt. 32 to 33½, diam. 16 to 17 mill.

Callao, Peru.

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Somewhat intermediate between *mutabilis* and *versicolor*, but the granulation is weak, almost obsolete as in the latter, and the shell is more solid than either.

B. AQUILUS (Reeve). Pl. 5, figs. 72, 73.

Shell umbilicated, ovate-conic, solid, regularly decussated with longitudinal and spiral lines. White, with irregularly scattered brown spots. Spire conic, rather acute, whorls 5½, somewhat convex, the last a little longer than the spire, somewhat compressed around the narrow umbilicus; columella white, subplicate above. Aperture little oblique, oblong-oval; peristome simple, the right margin narrowly expanded, columellar margin dilated and reflexed. Alt. 27, diam. 14 mill.; aperture, 15 mill. long, 7 wide inside. (*Pfr.*).

Tacna, Peru (Cuming).

Bulimus aquilus REEVE, Conch. Icon., pl. 22, f. 138 (1848).—PFR., Monogr., iii, p. 338.

"Approaching somewhat in character to *B. versicolor*" (*Rve.*). It may prove to be a *Lissoacme* of the group of *B. erythrostoma*.

Group of B. tupacii.

Species of the Andean plateau in Peru, and the adjacent, physically similar portion of Bolivia. The shells are larger, more solid, and with rougher sculpture than in the group of *B. culmineus*.

B. REVINCTUS (Hupé). Pl. 3, figs. 34 to 40.

Shell narrowly umbilicate, ovate obese, moderately solid, lusterless; buff-white, with numerous brown spiral bands and usually a few oblique streaks (or sometimes lacking spiral bands). Surface rather closely, irregularly wrinkle-striate and obsoletely granulated by decussating spirals in places; the apical whorls with *fine, close, wavy, vertical striæ*, beautifully regular and clear cut. Spire short, the apex obtuse, suture impressed and irregularly crenulated. Whorls 5 to 5½, moderately convex, the last fat-oval.

Aperture large, broad-ovate; outer lip blunt, unexpanded, columella concave, the margin broadly dilated above.

Alt. 29, diam. 19 mill.

Alt. 27, diam. 17 mill.

Bolivia: Cavari, Prov. Cochabamba, not far southeast from Inquisivi (Orb.); *Peru: Tarma* (Isern); *Huancabelica; from Tarma to Cuzco* (Angrand); varieties at *Huando* and *Sicaya* (Angrand).

Bulimus thamnoicus var. C, ORBIGNY, Voy., p. 291, pl. 37, f. 8.—*Bulinus thamnoicus var.* SOWB., C. Illustr., pl. 139, f. 72.—*Bulimus revinctus* HUPE, in Castelnau Exped., p. 39, pl. 7, f. 2 (1857).—PFR. Malak. Bl., 1859, p. 46.—HIDALGO, Journ. de Conchyl., 1870, p. 58; Viaje al Pacif., p. 112, pl. 5, f. 6.—MORELET, Sér Conch., iii, p. 174, pl. 8, f. 1.—PFR., Monogr., vi, p. 123.

The sculpture of the embryonic whorls is conspicuously different from that of *thamnoicus*. For the rest I cannot do better than to give Morelet's remarks on this species. He says: "The separation (of *B. revinctus* from *B. thamnoicus*) seems to us, after examining a great many shells, a legitimate one. The form of *revinctus* is more swollen, its spire shorter, the umbilicus generally more closed; finally the shell is thinner, less rudely striated, less distinctly granulated, the peristome little thickened. Generally the coloration is a yellowish-white or greenish-yellow, with wide and sometimes confluent purple-brown zones, the aperture likewise banded in the interior.

"We refer to the same species a variety collected at Huando, which differs perceptibly from the type at least in its secondary characters. This shell is a little less ventricose, of a very pale yellow with brownish or corneous longitudinal striæ, sometimes crossed by transverse linear bands; the aperture is white within or visibly roseate, the margins of the peristome are thin, and the umbilicus very narrow. We note also a small variety of a light fawn color with wide blackish bands, from Sicaya.

"*B. revinctus* inhabits the cold region of Peru, above the upper limit of the temperate region. It occurs throughout the extent of the Peruvian plateau, from Tarma to Cuzco, in rocky places, on garden walls, etc."

B. GAYI (Pfeiffer). Unfigured.

Shell partly covered umbilicate, conic-ovate, rather solid; brown variously ornamented with narrow white bands. Spire conic, obtuse. Whorls 5, moderately convex, the last a little longer than the spire, rounded at base. Columella lightly arcuate, aperture little oblique, truncate-oval, whitish inside; peristome simple, the right margin unexpanded, columellar margin much dilated, nearly closing the narrow umbilicus. Alt. 27, diam. 16; aperture 15 mill long, 9 wide. (*Pfr.*).

Bolivia (Mus. Cuming).

Bulimus gayi PFR., P. Z. S., 1856, p. 389; Monographia, iv, p. 467.—*Conf.* MORELET, Sér. Conch., iii, p. 176.

Probably a rather slender specimen of *B. revinctus*, as Morelet has surmised. Pfeiffer's diagnosis gives no satisfactory differential characters, though he says it differs from both *B. badius* Sow. and the small variety of *B. thamnoicus* in the umbilicus, sculpture and obtuse apex.

B. TUPACII (d'Orbigny). Pl. 3, figs. 27, 28, 29, 30, 31.

Shell narrowly umbilicate, oblong-conic, rather solid; yellow or yellowish-white with five bands and an umbilical patch of purple-brown, the three median bands wide; (or uniform dark brown). Surface irregularly wrinkle-striated and rather obsoletely decussated; the embryonic whorls densely punctate or punctate-wrinkled. Spire long. Whorls 7, moderately convex, separated by impressed, crenulated sutures, bordered below by a white line.

Aperture rather small, less than half the shell's length, banded or white inside; peristome slightly thickened within; columella with a slightly convex, deeply entering fold, the columellar margin broadly expanded.

Alt. 41, diam 20 mill. (specimen).

Alt. 75, diam. 35 mill. (Orbigny).

Bolivian Andes at Yanacache and Chupe (near Chulumani) *Prov. La Paz, and on the northeastern slope of the Cordillera in the southeastern part of the same province*, on dry garden walls, etc., æstivating in the ground (Orbigny). *Tucuman, Prov. Tucuman, Argentine Republic* (Borelli).

Helix tupacii D'ORB., Mag. de Zool., 1835, p. 16.—*Bulimus tupacii* D'ORB., Voy, dans l'Amér. Mérid., p. 292, pl. 38, f. 1–5.—REEVE, Conch. Icon., pl. xv, f. 86b (not 86a, 86c).—DOERING, Bol. Ac. Cordova, ii. pp. 338, 339 (varieties; anatomy).—PARAVICINI, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, ix, No. 181, p. 7, 1894.—? *Bulinus tupacii* SOWB., Conch. Illustr., f. 77.

The specimens before me correspond to fig. 31 of pl. 3. Those of d'Orbigny were larger. Dr. Borelli found small specimens at Tucuman, a locality far to the south of those given in the Voy. Amér. Mérid. Some specimens before me are labelled *Lima* and *Cuzco*.

The spire is proportionally longer in this species than in *B. thamnoicus*.

B. THAMNOICUS (d'Orbigny). Pl. 2, figs. 20, 21; pl. 30, fig. 9.

Shell oblong-conic, moderately solid, umbilicate; purplish-brown, with whitish and yellow irregular streaks and lines, the lighter color

sometimes predominating; or chestnut-brown with a few lighter streaks and a basal yellow band. Surface with rather coarse and irregular wrinkles in the direction of growth-lines, decussated by unequally spaced spiral incised striæ which cut the wrinkles into granules to a greater or less extent. Spire rather acutely conic, whorls 6 to 6½, the earlier densely and minutely wrinkle-pitted, slightly convex, separated by impressed sutures with a crenulated whitish border below.

Aperture half the shell's length or little more, vertical or slightly oblique, ovate, purple-white or purple inside, with a wide white border within the outer lip; peristome blunt, a little expanded below; columellar margin broadly dilated above.

Alt. 40, diam. 23; alt. of aperture 21 mill.

Alt. 42, diam. 23; alt. of aperture 22 mill.

Bolivian plateau: Palca and Capinata, prov. Cochabamba, and valley of Cochabamba, in gardens; Viloma (Orbigny); and in *Peru: from Obrajillo to Diezmo and Ocopa* (Angrand).

Helix thamnoica D'ORB., in Mag. de Zool., 1835, p. 16; Amér. Mérid., pl. 37, f. 4, 5, 6, 7.—*Bulimus thamnoicus* D'ORB., Voy. Amér. Mérid., p. 290 (exclusive of varr. *C, D.*).—PFR., Monogr., ii, p. 185.—MORELET, Sér. Conch., iii, p. 174.—*B. tupacii* (in part) REEVE, Conch. Icon., pl. 15, f. 86a, 86c.—*Bulinus thamnoicus* SOWB., Conch. Illustr., pl. 139, f. 70.

B. tupacii has the spire longer than this species, and the aperture is less than half the length of the shell, while in *thamnoicus* it is slightly or decidedly more than half the length. *B. alauda* is more elongated, less roughly striate, and has numerous interrupted spiral bands. *B. revinctus* is a smaller and much more obese shell, with different apical sculpture.

D'Orbigny regarded the light colored form, such as that figured on pl. 30, fig. 9, as typical. The intergradation of these with dark forms (pl. 2, fig. 21) is complete.

B. PLUTO (Crosse). Pl. 2, figs. 24, 25.

Shell with partly covered umbilicus, oval-oblong, quite thick, solid, grooved by longitudinal riblets and covered with a thin yellowish-fawn cuticle. Color livid fleshy-white with numerous small darker bands of chestnut-brown, of unequal sizes, and some spaced whitish maculations, neither numerous nor conspicuous. Spire conic, the apex rather obtuse. Suture quite irregular, whitish and crenu-

lated. Whorls, 7, quite convex, the two embryonic whorls smooth and polished, whitish; last whorl a little shorter than the spire.

Aperture oval, livid white inside; peristome thick, reflexed and white; margins joined by a thin parietal callus; the columellar margin nearly straight, strongly dilated and covering in part the umbilical perforation; basal margin wide, outer margin narrowing toward its upper insertion. Alt. 51, diam. 25 mill.; alt. of aperture 24, width with peristome 17 mill. (*Crosse*). *Peru.*

Bulimus pluto CROSSE, Journ. de Conchyl., xvii, 1869, p. 422; 1871, p. 62, pl. 2, f. 4.

Seems to be most nearly allied to *B. tupacii* Orb.

B. PETITI (Pfeiffer). Pl. 4, fig. 54.

Shell perforate, ovate-conic, rather solid, longitudinally rugose-striate, very obsoletely subdecussated with irregular concentric striæ; brown. Spire conic, the apex obtuse, pale, suture crenulated, white-edged. Whorls 6, rather flat, the last a little longer than the spire. Columella lightly arcuate. Aperture acute-oval, somewhat shining and livid inside; peristome simple, unexpanded, the right margin acute, columellar margin dilated, white, reflexed and free. Alt. 36, diam. 16 mill; aperture 19 mill. long, 11 wide. (*Pfr.*).

Peru (Mus. Cuming).

Bulimus petiti PFR., P. Z. S., 1846, p. 31; Monogr., ii, p. 185.—REEVE, Conch. Icon., pl. 37, f. 222.

B. PURPURATUS (Reeve). Pl. 4, fig. 57.

Shell umbilicate, ovate-conic, solid, thick, corrugated; purple-brown, with whitish streaks and spots. Spire conic, rather acute. Whorls 6½, nearly flat, plicate-crenate at the impressed suture, the last whorl a little shorter than the spire, rotund at base. Aperture nearly vertical, oval, white inside; peristome unexpanded, somewhat thickened within, the columellar margin much dilated, vaulted, reflexed. Alt. 36, diam. 16 mill.; aperture 18 mill. long, 9 wide. (*Pfr.*).

Andes of Catamarca, Peru (W. Lobb).

Bulimus purpuratus REEVE, P. Z. S., 1849, p. 98; Conch. Icon., pl. 71, f. 517.—PFR., Monogr., iii, p. 417.

B. WEDDELLI (Hupé). Pl. 3, figs. 32, 33; pl. 8, figs. 23, 24.

Shell oblong-acuminate, subventricose; ashy irregularly banded with somewhat squarish brown spots, here and there blotched with

white; whorls 6, somewhat convex, rugulose-striate, crenulated at the sutures. Aperture ovate, the peristome simple and acute; columella twisted, inner lip dilated, covering the umbilicus. Alt. 40, diam. 17 mill. (*Hupé*).

Environs of Lake Titicaca (Weddell).

Bulimus weddellii HUPE, in Castelnau Exped., p. 45, pl. 7, f. 5, 5a (1857).—MORELET, Sér. Conch., iii, p. 179, pl. 10, f. 2.—PFR., Monogr., vi, p. 114.

Morelet, whose remarks we quote below, enumerates three forms of this species:

a. Buff, variegated and interruptedly banded with purple-brown.

b. Purple-brown, variegated and blotched with buff.

c. Shell larger, more solid, ventricose, more distinctly granose-striate.

The coloration of this Bulimus is very variable. It consists of irregular spots of a reddish-brown sometimes scattered at random, sometimes distributed in spiral series, on a ground of pale yellow. The relation of ground-color to marking may be reversed, as is often the case in the coloration of shells; the marbling becoming yellow, the background reddish-brown. When this is the case the two colors almost always gain in intensity. In Mr. Angrand's collection there are specimens of a very deep reddish-brown variegated with quite bright yellow.

The third variety is more solid and obese than the type, with the spire shorter and the granulose striation more pronounced. It approaches *B. purpuratus* Rve., but differs in the narrower umbilicus, less dilated columellar margin, and the very perceptible granulation of the surface. As the specimen is unique I think it better to unite it to *weddelli* than to elevate it to specific rank. It is from Abancay, a region equally favorable in temperature to the cultivation of wheat, maize and cane. The other specimens were collected at a decidedly greater elevation, around Titicaca, by M. de Castelnau, and by M. Angrand, at Sorai, a cold place but sheltered, the Alpine vegetation beginning to be succeeded by ligneous plants (3,500 meters).

B. NEMORENSIS ('Philippi' Pfr.). Pl. 4, figs. 52, 53.

Shell perforate, ovate-conic, rather solid, longitudinally closely striate and irregularly decussated by impressed transverse lines; dull buff, variegated with streaks and spots of brown. Spire conic,

rather acute; sutures moderate, crenulated. Whorls 6½, the embryonic smooth and corneous, the rest slightly convex, the last whorl a little shorter than the spire, at base somewhat attenuated, rotund. Aperture little oblique, angulate-oval, with a rather pearly luster inside; peristome simple, unexpanded, the columellar margin white, shining, dilated above, vaultingly reflexed. Alt. 29½, diam. 13 mill.; aperture 14 mill. long, 8 wide. (*Pfr.*).

Between Ayapata and Ollachea, Prov. Puno, southeast Peru.

Bulimus nemorensis Phil., Pfr., Malak. Bl., xiv, 1867, p. 78; Novit. Conch., p. 345, pl. 81, f. 15, 16; Monogr., vi, p. 142.

Similar to *B. cotopaxiensis* Pfr.

B. angrandi (Morelet). Pl. 2, fig. 26.

Shell profoundly rimate, quite thick, oblong pyramidal, solid, rugose-striate; whitish flesh colored, clouded with close spiral lines and purple-red spots. Spire turrited. Suture white-edged, denticulate. Whorls 8, slightly convex, the last slightly ascending, nearly three-sevenths the shell's length. Columella white, deeply plicate. Aperture slightly oblique, oval, whitish inside; peristome simple, the right margin acute, unexpanded; columellar margin dilated. Alt. 51, diam. 19 mill. (Morel.).

Huancabelica, Peru, 3,752 meters alt. (Angrand).

Bulimus angrandi Morel., Journ. de Conchyl., viii, 1860, p. 372; Sér. Conch., iii, p. 173, pl. 9, f. 3.—Pfr., Monogr., vi, 133.

The entire surface of the shell is covered with irregular and superficial striæ, which enlarge little by little with the growth of the shell. Besides these, the lens shows other excessively fine, wavy striæ in the opposite direction, and effaced on the last whorl of the spire. The color of this Bulimus offers much analogy with *B. thamnoicus var. marmorata* [*B. alauda*]; on a ground of flesh tint, tinged visibly with fawn, there is a pattern of a multitude of transverse short lines of a reddish or purplish color, sometimes united into continuous zones, sometimes producing by their irregular disposition an agreeable dappled effect. (*Morel.*).

B. alauda (Hupé). Pl. 2, figs. 16, 17, 18, 19.

Shell narrowly umbilicate, ovate-oblong, rather solid; ashy-white with many spiral bands composed of brown dots and spots. Surface smoothish, with growth-wrinkles which are rather inconspicuous except toward the sutures, and obsoletely decussated in places, espe-

cially above; the apical whorls densely wrinkle-punctate. Spire acutely conic, the apex rather obtuse. Whorls 6 to 6½, moderately convex, the sutures impressed and finely crenulated, white-edged below.

Aperture about half the total length, hardly oblique, white and dotted within; outer lip simple, unexpanded; columella with a weakly convex entering fold, the columellar margin reflexed above.

Alt. 41½, diam. 22; alt. of aperture 21½ mill.

Peruvian plateau (Castelnau); *Environs of Chuquisaca, prov. Chuquisaca, Bolivia*, in gardens (Orb.).

Bulimus thamnoicus var. D. marmorata d'Orb., Voy. dans l'Amér. Mérid., p. 291, pl. 37, f. 9.—*Bulimus thamnoicus* Reeve, Conch. Icon., f. 94.—*Bulinus thamnoicus var.* Sowb., Conch. Illustr., f. 71.—*Bulimus alauda* Hupe in Castelnau, Anim. nouv. ou rares Exped. l'Amér. du Sud, Moll., p. 39, pl. 7, f. 3 (1857).—Pfr., Monogr., vi, p. 122.

The color-pattern seems to constantly separate this species from *thamnoicus*, and it is less obese than *revinctus*. *B. punctulifer* has different apical sculpture, and inhabits a region very different in physical features.

B. nucinus (Reeve). Pl. 9, figs. 35, 36.

Shell slightly perforated, ovate-conic, solid, most minutely granulated; whitish, irregularly painted with arcuate brown lines. Spire convex-conic, acute. Whorls 5½, a little convex, the last a little shorter than the spire, rotund at base. Columella somewhat straightened, slightly receding. Aperture subvertical, oval-oblong; peristome thick, unexpanded, the right margin lightly arcuate, columellar margin dilated above, reflexed, convex, subappressed. Alt. 37, diam. 17½ mill.; aperture 17 mill. long, 8 wide. (*Pfr.*).

Habitat unknown.

Bulimus nucinus Reeve, Conch. Icon., pl. 85, f. 629.—Pfr., Monogr., iii, p. 408.

Streaked like a *Plectostylus*, but solid, with thick lip. Habitat and affinities unknown.

Group of B. culmineus.

Andean species of Peru and Bolivia, with the shell smaller than in the preceding group, generally with spiral sculpture very weak or

lacking, striation not conspicuous; obliquely streaked or with interrupted spiral bands.

B. CULMINEUS (d'Orbigny). Pl. 5, figs. 74–78; pl. 8, figs. 30–32.

Shell narrowly perforate, ovate-conic, rather solid, whitish or light brown with numerous narrow oblique brown streaks. Surface irregularly wrinkle-striate, rather obsoletely decussated by spiral lines. Spire conic, apex obtuse. Whorls about 6, moderately convex; sutures well impressed.

Aperture somewhat less than half the shell's length, ovate; outer lip simple, columellar lip dilated above, columella concave or faintly convex above.

Alt. 32, diam. 15 mill.

Alt. 25, diam. 13 mill.

Bolivia; Islands in Lake Titicaca, and on surrounding mountains; and to the south, the mountains of prov. Carangas, especially the Pucara Mts., 5 leagues from Totora; always at an elevation of 3,800–5,000 meters (d'Orbigny); *La Paz* (Stübel); *Peru, at Huancabelica,* 2,000–2,200 meters alt.; *Andahuaylas* (Angrand). Inhabits from the snow-line to the temperate zone.

Helix culminea D'ORB., Rev. Zool., 1835, p. 13.—*Bulimus culmineus* D'ORB., Voy. Amér. Mérid., p. 288, pl. 33, f. 8, 9.—PFR., Monogr., ii, p. 221; vi, 143; Conchyl. Cab., p. 235, pl. 63, f. 1.—REEVE, Conch. Icon., pl. 54, f. 360.—MORELET, Sér. Conch., iii, p. 178, pl. 8, f. 4.—HUPE, in Castelnau Exped., p. 48, pl. 8, f. 4.—*Bulinus culmineus* SOWB., Conch. Illustr., f. 86.—MARTENS, Conch. Mittheil., pp. 162, 206, pl. 36, f. 10-12 (dentition and jaw).—*Bulimus jussieui* ("VAL. in Mus. Paris") PFR., P. Z. S., 1846, p. 33; Monogr., ii, p. 186.—REEVE, Conch. Icon., pl. 39, f. 242, not of Valenciennes.

The following color-forms occur:

a. Shell whitish.

b. Buff, unicolored or streaked with corneous.

c. Chestnut-brown, unicolored or streaked with buff.

Both around Lake Titicaca and at La Paz, Bolivia, Stübel found the slender, light colored form, and the stouter brownish yellow shells, living together.

My observation on this species are confined to moderate sized specimens of typical coloring. Morelet's notes on those collected by M. Angrand indicate a wide variability in the species. He

agrees with Pfeiffer in considering *B. jussieui* a variety of *culmineus*, and further comments substantially as follows: that this species is extremely variable is not astonishing, when we consider that it ranges over a considerable extent of country, from the temperate regions to an elevation of 5,000 meters, where reigns almost perpetual frost. Various modifications ensue, which, while not altering the essential characters of the species, yet would lead to erroneous conclusions if only the extreme forms of the series are compared. The size notably varies, as well as the length of the spire and the comparative diameter of the last whorl. It is the same with the coloration, which, from a gray-white passes gradually to pale yellow, thence to a pure ochre yellow; and, in turn, this color gives place to a dark brown, through intermediate shades of reddish-fawn. All these modifications are connected by insensible transition stages, no sharp limits being assignable.

According to M. d'Orbigny, *B. culmineus* is one of the species which live at the greatest heights, peopling the Andean plateau proper, descending from Desaguadero to Andahuaylas, into a temperate region where the vine flourishes. The grayish or uncolored examples are from the high country toward and in Bolivia; the yellow form was collected at Huancabelica, at an elevation of 2,000 to 2,200 meters—500 meters higher than the peak of Teneriffe.

B. SUBJUSSIEUI Pilsbry, n. n. Pl. 5, figs. 59, 60.

Shell ovate-conic, irregularly decussate-granular by rude striæ cut by fine spirals, subconic; ornamented with spiral brown bands, sometimes streaked; spire conic, subinflated; whorls 6, rather convex, the last as long as the spire. Aperture ovate, the peristome simple, acute; columella arcuate, dilated above and reflexed over the small, pervious, elongated umbilicus. Alt. 30, diam. 15 mill.

Province of Cuzco, Peru.

Bulimus jussieui (Valenciennes in Coll. Mus. Paris) HUPE, in Castelnau, Exped., p. 48, pl. 7, f. 4, 4a (1857).—*B. jussieui* Hupé, PFR., Malak. Bl., vi, 1859, p. 47; Monogr., vi, 127. Not *B. jussieui* Pfr., 1846=*B. culmineus*. *Conf.* also PFR., Malak. Bl., 1858, p. 165.

More ventricose than *B. culmineus*, with shorter spire, and banded like some specimens of *B. revinctus*, which, however, is a still shorter shell. Further investigation is needed to show the relation of this form to *B. culmineus*. It seems specifically distinct,

as claimed by Hupé, and admitted by Pfeiffer, who states that Hupé's shell is different from the *jussieui* of his previous description (which is figured by Reeve), and which came to Cuming's collection from the Paris Museum. It is not certain whether Hupé's *jussieui* is that of Valenciennes or not. Hupé's localities are frequently open to suspicion, doubtless owing to careless labelling on the part of the collectors who went to South America with Count Castelnau.

B. PENTLANDI (Reeve). Pl. 9, fig. 34.

Shell acuminately ovate, rather inflated at the base, scarcely umbilicated; whorls 6 in number, irregularly rudely striated, columella reflected. Aperture orbicularly ovate, lip simple. Dull olive, covered with an epidermis. (*Rve.*).

Alt. 22½, diam. 12 mill. (measurements of figure).

Mountains in the vicinity of Lake Titicaca, Bolivia (Pentland).

Bulimus pentlandi RVE., Conch. Icon., pl. 83, f. 614 (Dec., 1849). —PFR., Monogr., iii, p. 436.

B. EDWARDSI (Morelet). Pl. 7, figs. 11, 12, 13.

Shell perforate, oblong-conic, rather solid, whitish or buff, unicolored, variegated by narrow longitudinal brown streaks, or with five chestnut or purple-brown spiral bands. Surface coarsely irregularly wrinkle-striate, more or less decussated in places by spiral lines cutting the wrinkles into grannles; the apical whorls densely pitted. Spire long, convex-conic, the apex obtuse. Whorls 6 to 6½, moderately convex, the sutures impressed lightly above, deeper below.

Aperture decidedly less than half the shell's alt., ovate, white or banded inside; outer lip not expanded, somewhat thickened within; columellar lip flatly dilated above, the columella with a slightly convex fold.

Alt. 32, diam. 14; alt. of aperture 13½ mill.

Alt. 33, diam. 15½; alt. of aperture 14½ mill.

Alt. 29, diam. 12; alt. of aperture 13 mill. (Morel.).

Alt. 26, diam. 12½; alt. of aperture 12 mill.

Peru, in the Paucara chain; Huancabelica; valley of Huanta (Angrand); *Puno, L. Titicaca* (A. Agassiz).

Bulimus edwardsi MOREL., Séries Conch., iii, p. 182, pl. 9, f. 1.—PFR., Monogr., vi, p. 135.—*Bulimulus edwardsi* W. G. BINNEY, Proc. Acad. Nat. Sci. Phila., 1876, p. 191, and Ann. N. Y. Acad. Sci., iii, p. 124, pl. 11, f. K (dentition and jaw).

This species is more elongated than *B. æquatorius* Pfr., with smaller aperture. It is quite variable in degree of elongation and in coloration, besides the five-banded form specimens occur of a uniform reddish tint, and others are buff with inconspicuous, narrow brown streaks. Morelet describes a variety from Huanta which is smaller, alt. 24, diam. 11 mill., buff, with five bands, the shell thinner. Some small, thin, bandless examples are also before me. The dentition is normal for *Bulimulus*.

B. BADIUS (Sowerby). Pl. 4, fig. 49.

Shell perforate, ovate-acute, rather solid, rugulose-striate; tawny, variegated with rufous interrupted bands and series of dots. Spire conic, acute; whorls 5½, somewhat convex, the last about three-fifths the entire alt. Columella nearly straight. Aperture oval, whitish inside; peristome simple, acute, the columellar margin dilated, vaulted, reflexed, half covering the perforation.

Alt. 26, diam. 13½ mill.; aperture 15 mill. long, 8 wide. (*Pfr.*).

Prov. Xagua, Peru (Matthews); *Tarma* (Jelski).

Bulinus badius SOWB., P. Z. S., 1834, p. 141.—*Bulimus badius* PFR., Monogr., ii, p. 189.—REEVE, C. Icon., pl. 39, f. 235.—LUBOMIRSKI, P. Z. S., 1879, p. 724.—? *Bulimus polymorphus* var. *A.* ORB., Voy., p. 289, pl. 41, f. 1, 2.

The ventricose variety of d'Orbigny's *B. polymorphus* may prove to be a *badius*, as Pfeiffer holds. It is figured on pl. 4, f. 48.

B. POLYMORPHUS (d'Orbigny). Pl. 5, figs. 46, 47.

Shell oval or oblong, thick, substriate, subumbilicated. Gray-white, with four interrupted purple-brown zones; spire subconic, the apex obtuse; suture crenulated, nearly flat. Aperture oval; lip thickened, whitish. Alt. 25, diam. 10 mill. (*Orb.*).

On the coast?, Peru (Fontaine).

Helix polymorpha D'ORB., Mag. de Zool., 1835, p. 20.—*Bulimus polymorphus* D'ORB., Voy., p. 289, pl. 41, f. 3, 4, 5.

The ventricose form mentioned and figured by d'Orbigny is probably referable to *B. badius*. See pl. 4, f. 48.

B. PROMETHUS (Crosse). Pl. 4, figs. 55, 56.

Shell perforate, oblong-acute, rather thin, rugose-striate, dull rose-white, encircled by interrupted chestnut bands. Spire conic, the apex somewhat obtuse; suture irregularly impressed, dentate. Whorls 6, slightly convex, the embryonal 1½ smooth, rose-whitish,

the succeeding 1½ roseate, unicolored, antepenultimate and penultimate whorls with two interrupted chestnut bands; the last whorl about as long as spire (17 : 18), interruptedly four-banded.

Aperture oblong-ovate, livid whitish inside; peristome white, the columellar margin nearly straight, dilated, nearly covering the perforation, basal and outer margins somewhat thickened, not reflexed. Alt. 35, diam. 17 mill.; aperture 17 mill. long, 9 wide. (*Crosse*).

Peru.

Bulimus promethus CROSSE, Journ. de Conch., 1869, p. 423; 1871, p. 63, pl. 2, f. 3.

This species seems to be allied to *B. polymorphus* Orb.

B. FERRUGINEUS (Reeve). Pl. 9, fig. 37.

Shell perforate, ovate-conic, a little solid, rather smooth, striatulate; white, ornamented with irregular rufous streaks and 3 or 4 interrupted basal bands. Spire conic, acute; whorls 6½, a little convex, the last rounded, slightly shorter than the spire; columella very slightly arcuate. Aperture little oblique, oval; peristome simple, unexpanded, the right margin arcuate, columellar margin vaultingly reflexed above, spreading. Alt. 19, diam. 9 mill.; aperture 9½ mill. long, 6 wide. (*Pfr.*).

Peru (Cuming Coll.).

Bulimus ferrugineus RVE., Conch. Icon., pl. 62, f. 424.—PFR., Monogr., iii, p. 416.

B. PERISTOMATUS (Doering). Unfigured.

Shell perforated, ovate-oblong, subfusiform, rather thin, densely and irregularly rugose-striate, dull whitish. Spire oblong-conic, suture frequently subcrenulate-margined. Whorls 6, slightly convex, *the first rugulose-striate*, brownish, the last longer than the spire, effuse in front. Columella obsoletely folded. Aperture subvertical, ovate, yellow inside, shining; *peristome simple, expanded throughout*, the basal margin arcuate, columellar margin dilated, *terminations converging*, joined by a thin callus. Alt. 27–29, diam. 11–13½ mill.; aperture, alt. 15–16, width 9–10 mill. (*Doer.*).

Sierra de Pocho, Argentina.

Scutalus peristomatus DOER., Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 66 (1879).

Smaller than *B. stelzneri*, oblong, the peristome expanded throughout and with converging terminations. Jaw with 8–10 riblets.

Group of B. æquatorius.

A group of the Ecuador Andes, characterized by the narrow or imperforate umbilicus, etc.

B. ÆQUATORIUS (Pfeiffer). Pl. 7, figs. 1, 2, 3, 4, 5.

Shell oblong-ovate, narrowly umbilicate, solid, whitish or light brownish-yellow, with indistinct white vertical streaks, encircled with three purple-brown bands, the middle one often narrower, all generally more or less interrupted and usually not sharply defined, sometimes obsolete. Surface lusterless or somewhat shining, irregularly wrinkle-striate, sometimes obsoletely decussated above. Apical whorls *densely and minutely wave-striate,* sometimes appearing striate-pitted. Spire convex conic, the apex rather obtuse. Whorls 6, rather convex. Sutures impressed. Aperture half the length of shell, ovate, slightly oblique, banded, or white inside; peristome simple, the outer lip not expanded, columellar lip quite broadly dilated above, columella with a convex entering fold.

Alt. 34, diam. 17½ mill.

Alt. 32, diam. 16 mill.

Alt. 26½, diam. 13 mill.

Ecuador: Mt. Chinchulagua and Chimborazo (Bourcier); *Quito and environs* (Paz, Orton, Boetzkes and others); *La Mocha* (Paz); *Mululó, near Lacatunga, at the foot of Cotopaxi,* 3059 meters alt. (Stübel); *Casha Loma; Mt. Pinchincha, near Quito* (Cousin).

Bulimus æquatorius PFR., P. Z. S., 1852, p. 155; Mongraphia, iii, p. 420; viii, p. 170; Conchyl. Cab., p. 101, pl. 33, f. 1–4.—HIDALGO, Journ. de Conchyl., 1870, p. 59; Viaje al Pacif., p. 104.—CROSSE, Journ. de Conchyl., 1871, p. 317.—*Scutalus æquatorius* MILLER, Malak. Bl., xxv, 1878, p. 193.—*Bulimulus (Scutalus) æquatorius* MARTENS, Conch. Mittheil., p. 161.—*Thaumastus æquatorius* COUSIN, Bull. Soc. Zool. de France, xii, 1887, p. 222 (with vars. *major, interrupta* and *immaculata,* mentioned but not described).

This species is quite variable. The bands are interrupted by white streaks into spots in some examples, in others being very irregularly interrupted at wide intervals, and rarely almost continuous. The body-whorl occasionally lacks bands, having a few oblique brown streaks or none; the young are almost imperforate. The color-varieties seem to occur too indiscriminately to allow of varietal distinction in the five trays of this species before me.

B. OCHRACEUS (Morelet). Pl. 5, fig. 58.

Shell perforate, oblong-oval, rather solid, rudely subgranulose-striate, buff or brownish, unicolored, rarely obscurely banded. Spire conic, the apex obtuse. Suture pale-edged. Whorls 5, little convex, the last a little exceeding the spire, rotund at base. Columella obliquely receding, whitish. Aperture oval, white or reddish-brown inside; peristome simple and unexpanded, the columellar margin dilated and vaultingly reflexed. Alt. 37 to 40, diam. 17 to 18 mill. (*Morel.*).

Sorai and Salcantai, Peru (Angrand).

Bulimus ochraceus MORELET., Séries Conch., iii, p. 176, pl. 7, f. 6 (1863).—PFR., Monogr., vi, p. 127.—Not *Bulimulus ochraceus* BECK, Index Moll., p. 67 (a nude name).

This species differs from its allies principally in the obtuse form of the apex, as well as in having the number of whorls reduced to 5 or sometimes 4½. With the exception of the first whorl of the spire, on which may be seen, under the lens, a sort of rudimentary granulation, the entire shell is covered with quite prominent, unequal, close longitudinal striæ, granulous in some places; and with a sufficient magnification feeble concentric impressions are visible here and there, but no real transverse striæ.

The *B. cotopaxiensis* Pfr. is the nearest species, but may be distinguished by one or other of the following characters: *B. ochraceus* is generally larger, with one whorl less; the last whorl exceeds the spire in length; the columellar dilation is more pronounced, and finally the surface of the shell shows only rare, and as it were accidental granulations, instead of being the result of a regular decussation of striæ as in *B. cotopaxiensis*. (*Morel.*).

B. COTOPAXIENSIS (Pfeiffer). Pl. 4, figs. 50, 51.

Shell perforate, oblong-ovate, rather solid; striate and granulate-decussate by spiral lines, disappearing below the middle of the body whorl. White under a tawny-yellow, often brown-streaked or interruptedly banded, cuticle. Spire convex-conic, the apex rather obtuse. Whorls 6, little convex, the last as long as the spire, rotund at base. Columella somewhat straightly receding. Aperture little oblique, oval, white inside, shining; peristome simple, obtuse, unexpanded, the right margin lightly arcuate, columellar margin dilated, white, vaultingly reflexed. Alt. 34, diam. 16 mill.; aperture 17 mill. long, 9½ wide in the middle. (*Pfr.*).

Cotopaxi, Ecuador; variety at *Mt. Cayembe* (Bourcier); *Antisana and Pichincha* (Martinez); *La Mocha* (Paz), among stones; *Tumbaco, Cayembe* (Boetzkes): *descent of Achupallas on the river Sula* (Cousin).

Bulimus cotopaxiensis PFR., P. Z. S., 1852, p. 155.—Conchyl. Cab., p. 103, pl. 33, f. 9, 10; Monogr., iii, 419.—HIDALGO, Viaje al Pacifico, p. 105.—MARTENS, Conch. Mittheil., ii, p. 161.—COUSIN, Bull. Soc. Zool. France, 1887, p. 225.—*Scutalus cotopaxiensis* MILLER, Mal. Bl., XXV, p. 193.

Variety (fig. 50). Spire elongated, closely marbled with brown, the spiral lines continuing to the base of last whorl. Alt. 35, diam. 15 mill.; aperture 16 mill. long, 8 wide (*Pfr.*).

Hidalgo observes that the lip-edge always has the same color as the epidermis. He questions its distinctness from *B. subfasciatus* Pfr., which differs only in being a little rougher, with narrow, vertical columella, and of slightly darker color.

B. SUBFASCIATUS (Pfeiffer). Pl. 8, fig. 33.

Shell subperforate, oblong-ovate, rather solid, longitudinally rugose-striate and irregularly decussate-granulate, tawny, encircled by two or three obsolete brown bands. Spire convex-conic, the apex obtuse. Whorls 6, rather convex, the last as long as the spire, rotund at base. Columella vertical; aperture subvertical, oblong, white within, shining; peristome unexpanded, somewhat thickened, right margin spreading above, columellar margin dilated above, white, reflexed, almost adnate. Alt. 32, diam. 14 mill.; aperture 16 mill. long, 9 wide. (*Pfr.*).

Mt. Antisana, Ecuador (Bourcier).

Bulimus subfasciatus PFR., Monogr., iii, p. 408 (1853); P. Z. S., 1852, p. 60; Conchyl. Cab., p. 105, pl. 33, f. 19.—Conf. HIDALGO, Viaje al Pacif., p. 106.

Hidalgo comments on the evident proximity of this species to *B. cotopaxiensis* Pfr., surmising the identity of the two.

B. ANTHISANENSIS (Pfeiffer). Pl. 4, figs. 41, 42.

Shell imperforate, ovate-conic, rather solid, rugose-striate and granulate; silky; chestnut, marbled with tawny and buff. Spire conic, the apex rather acute. Whorl 6½, nearly flat, the last equal to the spire in length, somewhat tapering toward the base. Columella callous, rather straightly receding. Aperture subvertical, semioval, livid inside; peristome simple, unexpanded, the right

margin lightly arcuate, columellar margin callous and dilated above, adnate, white. Alt. 40, diam. 17 mill.; aperture 21 mill. long, 10½ wide. (*Pfr.*).

Mt. Antisana, Ecuador, 14,000 ft. (Bourcier); *Cerro del Altar, at Riobamba*, near the snow line, 4,200 meters alt. (Stübel).

Bulimus anthisanensis PFR., P. Z. S., 1852, p. 155; Conchyl. Cab., p. 104, pl. 33, f. 20, 21; Monogr., iii, p. 406.—*Bulimulus* (*Scutalus*) *antisanensis* Pfr., ALB.-MART., Die Hel., p. 217.—MARTENS, Conch. Mittheil., p. 161.

Stübel's specimens were dark green-brown, with small yellowish flecks, the dark color not so sharply confined to the lower half of the last whorl as in the figures.

B. CALIGINOSUS (Reeve). Pl. 4, figs. 43, 44, 45.

Shell subimperforate, oblong-ovate, rather solid, obliquely rudely striate, ashy or whitish, irregularly streaked with ferruginous brown. Spire conic, rather acute. Whorls 6, slightly convex, the last about as long as the spire, rotund at base. Aperture subvertical, oval; peristome simple, unexpanded, the columellar margin broadly reflexed and appressed above. Alt. 36, diam. 16 mill.; aperture 19 mill. long, 10 wide. (*Pfr.*).

Ecuador: Tunguragua and Chimborazo (Bourcier); *Cerro del Altar, near Riobamba*, near the snow line, 4,200 meters alt., and *Pitana in the eastern Cordillera of Quito*, 3,600 meters (Stübel); *Casha Loma, near and above Chillogalo* (Cousin).

Bulimus caliginosus REEVE, Conch. Icon., pl .82, f. 609 (1849).—PFR., Conchyl. Cab., p. 103, pl. 33, f. 13–16; Monogr., iii, p. 407; viii, p. 145.—HIDALGO, Journ., de Conch., 1870, p. 59.—*Thaumastus caliginosus* COUSIN, Bull. Soc. Zool. Fr., xii, 1887, p. 223.—*Bulimulus* (*Scutalus*) *caliginosus* MARTENS, Conch. Mittheil., pp. 161, 204 (dentition).

Specimens collected by Stübel at Cerro del Altar are yellowish-brown, streaked, 38 mill. long, 19 broad, aperture 19 mill. high. Those from Pitanà are somewhat wider, dark-purple, the suture and base yellowish, 31 mill. long, 17 wide, aperture 16 mill. high. (*Martens*).

B. COUSINI (Jousseaume). Pl. 5, fig. 61.

Shell imperforate, ovate-conic, rather solid, very delicately striated, brown, somewhat shining; spire conic; whorls 6, slightly convex, the last ventricose, one-half the length of the shell. Aperture sub-

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oval, livid and shining within; peristome whitish-rose, simple; the margins joined by a callus, right margin slightly thickened, columellar margin dilated. Alt. 41, diam. 23 mill.; aperture 24 mill. long, 13 wide. (*Jouss.*).

Concha, Ecuador (Cousin).

Rhabdotus cousini Jouss., Bull. Soc. Zool. France, xii, p. 167, pl. 3, f. 18 (1887).

B. irregularis (Pfeiffer). Pl. 5, fig. 71.

Shell umbilicated, ovate-oblong, rather solid, roughened by close longitudinal folds; flesh colored, somewhat streaked with brownish; spire conic, rather acute, the apex reddish. Whorls 6, slightly convex, the last slightly shorter than the spire, subangularly compressed around the narrow, impervious umbilicus. Columella lightly arcuate. Aperture elliptical, subangular at the base; peristome simple, unexpanded, the columellar margin reflexed at base and dilated above. Alt. 19, diam. 9 mill.; aperture 10 mill. long. (*Pfr.*).

Quito, Ecuador (de Lattre); *Imbabura, Tumbaco, Mt. St. Antonio, Calacali, hill of Guallabumbo near Turu, and Riobamba* (Cousin); *Salinas Ibarre, Prov. Imbabura*, 1659 meters alt. (Stübel).

Bulimus irregularis Pfr., P. Z. S., 1847, p. 231; Monogr., ii, p. 183.—Reeve, Conch. Icon., pl. 65, f. 454.—*Bulimulus* (*Scutalus*) *irregularis* (including *B. catlowæ*) Martens, Conch. Mittheil., p. 162.—*Scutalus irregularis* Miller, Malak, Bl., xxv, 1878, p. 194. —*Thaumastus irregularis* Cousin, Bull. Soc. Zool. France, 1887, p. 225.

This form is somewhat more slender than *B. catlowiæ*, with smaller umbilicus, but does not seem to present any other differences. Von Martens unites them.

The shells recorded by Hidalgo in Journ. de Conch., 1870, p. 63, as *B. irregularis*, from Ibarra and Otavalo, Ecuador, were afterward decided by him to be *B. quitensis* Pfr.; but *irregularis* and *catlowiæ* are apparently not specifically separable from the prior *B. quitensis*.

Var. catlowiæ (Pfeiffer). Pl. 5, figs. 67, 68, 69, 70.

Shell narrowly umbilicate, oblong, ovate or conic, rather thin; closely and irregularly wrinkle-striate, lacking spiral striæ. Varying from flesh-colored to dark purplish-brown, with lighter lines and streaks. Spire conic, the apex rather small, ruddy or pale,

earlier 2 whorls vertically, closely and minutely lineolate-punctate. Whorls 6 to 7, moderately convex.

Aperture ochre-brown to deep purple-brown inside, about half the shell's length or slightly less; peristome thin and unexpanded, the columellar margin dilated above.

Alt. 25, diam. 12½ mill.

Alt. 21½, diam. 11 mill.

Quito (Bourcier); *Ambato* (Paz); *Pillaro* (Martinez); *Ecuador.*

Bulimus catlowiæ Pfr., P. Z. S., 1852, p. 154; Conchyl. Cab., p. 101, pl. 33, f. 5, 6; Monogr., iii, p. 427.—Hidalgo, Viaje al Pacifico, p. 128, pl. 7, figs. 9, 10.—*B. catlowæ* of some authors.—*Bulimus catloviæ* and *B. irregularis* (Pillaro specimens) Hidalgo, Journ. de Conch., 1870, p. 63; compare J. de C., 1875, p. 128.—*Scutalus catlowiæ* Miller, Malak. Bl., xxv, p. 194.

This form, with *B. irregularis*, are probably varieties of *B. quitensis* Pfr., which I have placed in *Lissoacme*, not knowing the apical characters (see vol. x, p. 158).

Subgenus Bulimulus Leach.

Bulimulus Leach, Zool. Misc. i, p. 41 (1815).—*Leptomerus* Albers, Die Hel. p. 166 (1850).—Alb. Mart., Die Hel. p. 222, type *B. linnæoides* Fér.

Bulimuli of ovate or oblong contour, perforated, uniform brown or corneous, or rarely with a few spiral bands; aperture ovate, the outer lip simple or but slightly expanded, thin or thickened within. Apical whorls delicately rugulose. Type *B. exilis* Gmel.

Distribution, tropical America, extending South in eastern South America to Argentina.

It is practically impossible to draw a line between typical *Bulimulus* and *Leptomerus*. *B. exilis*, type of the former group, varies from quite solid and thick forms to others of thin substance, and from banded to one-colored specimens; and as the sole differential character of *Leptomerus* is the delicacy of its monochromatic shell, it is readily seen, when any large series of the Antillean species is examined, that this supposed distinction is artificial and impracticable.

In some of the thinner species, such as most of those of Central and South America, the apical sculpture is shallow and faint, requiring a strong lens and well preserved specimens. As the apices of many of the Argentine Bulimuli are unknown, it is not unlikely

that some species placed in *Lissoacme* may really belong to the restricted subgenus *Bulimulus*. (*Conf.* Man. Conch. X, pp. 187–194).

The species of this subgenus are among the most difficult *Bulimuli* to distinguish, being founded in most cases on slight and inconspicuous differences. It will readily be understood that too much reliance should not be placed upon the "keys" I have attempted to make. They merely offer suggestions.

Antillean Species.

With the exception of *B. sepulcralis*, which is most nearly allied to Central American forms, the Antillean species form a moderately homogenous group, having the apical sculpture more distinct than in continental forms.

a. Shell rather solid or thick.
- *b.* Often banded; smoothish; alt. 20-25 mill. *exilis.*
- *bb.* Opaque reddish brown or olivaceous, with puckered striæ; lip thickened within; alt. 27–30 mill. *nichollsi.*
- *bbb.* Fossil; with low growth wrinkles, *riisei.*
- *bbbb.* Opaque whitish; coarsely plicate, *lehmanni.*

aa. Shell thin, more or less translucent, often with cuticular spirals.
- *b.* Aperture and diameter one-half the length of shell or more.
  - *c.* Edge of lip very narrowly expanded; whorls about 5½.
    - *d.* Brown with light peripheral girdle; periphery subangular in front; surface with spiral cuticular liræ. *semicinctus.*
    - *dd.* Brown with whitish dots, *lherminieri.*
  - *cc.* Lip-edge not expanded.
    - *d.* Alt. 14–15 mill. *houelmontensis.*
    - *dd.* Alt. 20–21 mill. *barbadensis.*
- *bb.* Aperture less than half the alt. of shell.
  - *c.* Peristome narrowly expanded; whorls 7–8; no spiral sculpture (?). *limnoides, chrysalis, martinicensis.*
  - *cc.* Peristome unexpanded, sharp.
    - *d.* Aperture about ⅓ alt.; alt. 19, diam. 7 mill. *mazei.*
    - *dd.* Aperture nearly ½ alt.; cuticular spirals present, *fraterculus diaphanus.*

aaa. Shell thin, corneous, smooth, without spiral striæ, the apical sculpture subobsolete; whorls well rounded; aperture under half the alt. *sepulcralis.*

B. EXILIS (Gmelin). Pl. 9, figs. 61, 62, 63, 64, 65, 66, 67.

Shell very narrowly perforate, narrowly oblong, varying from thin to quite solid; various in color, being (typical) soiled white or yellowish with three dark brown bands, the upper and lower wide, suture white margined, or (form *acutus* Leach) with a single narrow peripheral band, or (form *albus* Sowb.) unicolored yellowish or whitish, or (form *obscurus*) brown or purple-brown, unicolored except for a light sutural line. Surface lusterless, almost smooth, the growth-lines faintly indicated, and some specimens showing fine and faint spiral striation. Spire high-conic with slightly convex outlines, the apex obtuse, earlier 1¾ whorls densely and finely zigzag striolate; whorls about 6½, a trifle convex, the last a little deflexed in front. Aperture varying from nearly half to less than a third the total alt. of shell, somewhat oblique, ovate; white, purple-brown or banded within; peristome more strongly arcuate above, slightly or very heavily calloused within; columella nearly straight, its edge well reflexed; parietal callus generally slight.

Alt. 20, diam. 9 mill.; alt. of aperture 9 mill.

Alt. 27, diam. 11 mill.; alt. of aperture 11·2 mill.

Alt. 23·5, diam. 8·5 mill.; alt. of aperture 8·6 mill.

Caribbees, from Barbados and Martinique to the Virgin Is., and west to Haiti. Barbados (Parkinson, Feilden, Rush); *Martinique* (Maze); *Dominica* (Guppy, A. D. Brown, Ramage, Angas, Sharp, Verrill); *Guadelupe* (Cochrane, de Badier, Maze, Sharp, Beau), *with Grande Terre* (Sharp), *Saintes, Desirade and Marie Galante* (Maze); *Montserrat* (Rawson); *Antigua* (Hamilton); *St. Bartholomew* (Cleve); *St. Christopher or St. Kitts* (Hamilton, Rush); *Barbuda* (according to Pfr.); *St. Martin* (Bland, Maze); *Tortola; St. Thomas* (Bland, Sallé, Schramm, 'Challenger' Rush); *Viéque* (Riise, Swift); *Porto Rico* (Swift, Krug), *at Jabacoa* (Sintensis); *Haiti at Cape Haitien* (Rolle), *Aux Cayes* (Swift, Sallé).

Colonized: *Jamaica at Castleton* not far from the botanic gardens, abundant (Roper).

Doubtful localities: *St. Vincent* (Guilding, according to Pfr.); *Cayenne* (Eyriès).

Helix exilis GMEL., Syst. Nat. (13), p. 3668.—*Bulimus exilis* DESH. in Lam., An. s. Vert., viii, p. 232.—KUSTER, Conchyl. Cab., p. 52, pl. 10, f. 14, 15.—PFR., Monogr., ii, p. 223; iii, 433; iv, 498; vi, 145; Conchyl. Cab., p. 52, pl. 63, f. 15–18.—REEVE, Conch. Icon., pl. 46, f. 292.—BLAND, in Adams' Contrib. to Conch., no. 11, p. 219; Ann. Lyc. N. Y., vii, pp. 351–360; and xi, p. 200.—A. D. BROWN, Amer. Nat., xv, 1881, p. 56.—ROPER, Nautilus, ix, p. 14.—GUPPY, Ann. Mag. N. H. (4), i, p. 431.—ANGAS, P. Z. S., 1883, p. 596.—SHARP, Proc. Acad. Nat. Sci. Phila., 1890, p. 148; Ann. Mag. N. H. (6), vi, p. 124.—*Bulimulus exilis* Gm., MAZE, Journ. de Conchyl., 1874, p. 164; 1883, p. 17, 43, 48; 1890, p. 24.—CROSSE, Journ. de Conchyl., 1891, p. 129.—MARTENS, Jahrb. d. M. Ges., iv, 1877, p. 351; Nachrbl. d. M. Ges., 1891, p. 132.—E. A. SMITH, P. Z. S., 1884, p. 277; Ann. Mag. N. H. (6), ii, 1888, p. 231; Proc. Malac. Soc. Lond., i, p. 305.—PILSBRY, Trans. Conn. Acad., viii, 357.

Bulimus guadalupensis BRUG., Encycl. Méth., i, p. 313 (1792).—LAM., An. s. Vert., vi, (2d pt.), p. 123.—DESH. in Lam. edit. 2, viii, p. 232.—GUERIN, Iconogr. du Regne Anim., Moll., pl. 6, f. 11.—*Helix* (*Cochlogena*) *guadalupensis* Brug., FER., Tabl. Syst., p. 54, no. 394.—*H. guadeloupensis* WOOD, Index Test., p. 174, pl. 35, f. 157a, 158*.—DILLWYN, Descr. Catal., ii, p. 957.—*Bulimus guadaloupensis* REEVE, Conch. Icon., pl. 46, f. 294a, b.—*Bulimulus gouadaloupensis* Brug., BECK, Index Moll., p. 66.—*Bulimulus guadalupensis* FISCHER, Journ. de Conchyl., 1872, p. 293 (jaw and teeth), Etudes Moll. Terr. et Fluv. Mex., p. 470, pl. 19, f. 13 (jaw), 14, 15 (teeth), 16 (genitalia).—SEMPER, Reisen im Archip. Phil., Landmoll., iii, p. 154, pl. 17, f. 14 (anatomy).—*Bulini guadaloupensis* var. *alba* SOWB. in Zool. Beechey's Voy., p. 144, pl. 38, f. 13 (1839).

Helix dentrita (at least in part), MONTAGU, Test. Brit., p. 385.

Bulimulus acutus LEACH, Zool. Miscellany, i, p. 41, pl. 18, lower figs. (1815).

Bulimulus trifasciatus LEACH, *t. c.*, p. 42, pl. 18, upper figs.—SOWB., Conchol. Manual, p. 14, fig. 283.

Bulimus rubrifasciatus REEVE, Conch. Icon., pl. 44, f. 277.

Bulimulus simplex BECK, Index, p. 66.

? *Bulimulus antiguensis* Guilding, SWAINSON, Malacology, p. 335.

Gmelin's typical *exilis* was the ordinary form with three bands, later called *trifasciatus* by Leach and *rubrifasciatus* by Reeve. *B. guadalupensis* Brug. was founded on specimens with the lip much

thickened within, a common character in Guadelupe shells. *B. acutus* Leach and *simplex* Beck were based on shells with a peripheral dark line on a light ground. Gmelin correctly considered these various band forms as specifically identical; and they cannot be said to constitute even varieties in the true sense. Probably all of the color combinations will be found wherever *exilis* occurs, although one or other usually predominates in each restricted station of the species. Thus out of 44 specimens from Barbados, 36 are yellow or whitish, bandless (mostly dark on the spire), and 8 are 3-banded. Of 27 Dominica shells, 10 are light and bandless, 6 are 3-banded; 7 are 1-banded; and the rest are uniform dark shells. In a tray containing 79 shells from Guadelupe (Grande Terre), 65 are 1-banded, 10 bandless, 4 3-banded. Another tray from Guadelupe contains 7 3-banded, 4 1-banded and two dark and bandless examples. Similar variations of the proportions occur in the shells before me from St. Thomas, St. Kitts, Antigua, Tortola, St. Lucia, St. Martins, St. Barts, Vieque, Pto. Rico, Haiti.

In form, some of the Haitian shells are slenderest, while very stout examples occur (with normal forms) in Dominica, Porto Rico and Barbados. Many Guadelupe specimens are extremely thick, and heavier than those from other localities; but no general rule can be deduced governing the form or solidity, which vary independent of the color-variation, and largely without regard to geographic position. These variations are doubtless dependent upon the peculiarities of station, individuals inhabiting calcareous districts being heavier than those from volcanic tracts or those poor in lime.

B. exilis has been reported from Cayenne (Eyriès, see Drouet, Moll. Terr. Guyane Française, p. 62), but no doubt erroneously. It is evident to anyone critically reviewing Drouet's French Guiana list, that lieutenant Eyriès mixed shells from the French Antilles with his Guiana material, probably being unaware of the importance of geographic data. The continental localities for species known to be Antillean, incorporated into Pfeiffer's works from this source, must all be received with great reserve.

There is nothing intrinsically improbable in the locality St. Vincent, but its confirmation is needed; on the other hand, the occurrence of the species on the South American main seems very doubtful.

Var. EYRIESII (Drouet). Pl. 12, figs. 52, 53 (type); 54–60.

Shell perforate, elongate-acuminate, quite thin, somewhat translucent, lusterless, of a uniform gray-reddish shade. Smoothish, but

very delicately striated spirally. Whorls 7; spire elevated and acute. Aperture slightly oblique, long-ovate, somewhat whitish within, less than half the length of shell; peristome unexpanded, sharp and simple. Alt. 26, diam. 10–11, alt. of aperture 11, width 6 mill. (*Drouet*).

Ilet-la-Mère, French Guiana, on tree trunks (Eyries); *Guadelupe* (Mazé).

Bulimus eyriesii DROUET, Essai sur les moll. terr. et fluv. de la Guyane Française, p. 63, pl. 1, f. 12, 13 (1859).—PFR., Monogr., vi, p. 147.—*Bulimulus eyriesii* Dr., MAZE, Journ. de Conchyl., 1883, p. 17; J. de C., 1890, p. 24.—*Bulimulus fraterculus* Fér., REEVE, Conch. Icon. pl. 63, f. 438.—BLAND, Annals of the Lyceum, N. Y. vii, p. 351, etc.—*Bulimulus fraterculus* Fér., SMITH, Ann. Mag. N. H. (6), viii, 1891, p. 252; Journ. of Conch. viii, 1896, p. 241. Not *B. fraterculus* (Ferussac) P. & M.

Under the above varietal name I place a very large series of shells before me, which agree in essential characters with the thinner and unicolored forms of *B. exilis*, and in fact offer every possible gradation with that species. Typically, var. *eyriesii* is a little more conoidal and wider below; it is never banded, being whitish-corneous, light brown, or dark purplish-brown; it is thinner than typical *exilis*, but varies in this respect. Faint, close epidermal spirals are present on fresh or unrubbed shells, and in a state of nature the surface carries considerable adherent soil in many cases. The last whorl is less swollen than in *B. barbadensis*. Specimens referable to this form are before me from Barbados, St. Lucia, Guadelupe, Nevis (fig. 60), St. Kitts, (figs. 58, 59), St. Croix, St. John, St. Thomas, (fig. 57), Antigua, Vieque and Porto Rico, (figs. 54, 55). It apparently inhabits Trinidad also, although I have seen no specimens from thence; and if we may trust Drouet's information, Mère Island, off French Guiana.

As M. Charles Eyriès visited Martinique as well as Guiana, and mixed his shells, some little uncertainty may be felt in the localities given for his specimens. Mazé reports *B. eyriesii* from "Basse-Terre, vanlieue, morne à Vaches" Guadelupe, and islet of Saint-Martin, Morne des Accords (Van Rijersma), alt. 310 meters, on tree trunks and under stones in the shade.

B. NICHOLLSI (A. D. Brown). Pl. 9, figs. 55, 56.

Shell perforated, ovate-conic, solid and strong, reddish-brown or olivaceous, sometimes with a narrow light peripheral girdle, the

earlier whorls denuded of cuticle and purplish-brown; scarcely shining; striation irregular and rather sharp, *more or less cut into spiral puckered zones* by spaced spirals which cut merely the striæ; spire somewhat convexly conic, apex obtuse, criss-cross granulate, generally eroded. Whorls 6½, slightly convex, the last convex.

Aperture squarish-ovate, slightly oblique, flesh-colored inside, less than half the shell's length; peristome considerably thickened within, bevelled, the outer lip more strongly curved and slightly sinuous toward the upper insertion; columella subvertical, nearly straight or slightly convex; the columellar margin reflexed and dilated, forming an angle with body of shell; parietal callus thin and translucent.

Alt. 30, diam. 14 mill.; alt. of aperture 13 mill.

Alt. 27, diam. 15 mill.; alt. of aperture 12⅓ mill.

Dominica (Brown, Angas, Ramage, Sharp).

Bulimus nicholsii A. D. Brown, American Naturalist, xv, p. 57, Jan., 1881 (no description).—*Bulimus nichollsi* A. D. Brown mss., Angas, P. Z. S., 1883, p. 596, p. 595, f. 2, 3.—*Bulimus* (*Thaumastus*) *nichollsi* Brown, Smith, Ann. Mag. N. H. (6), ii, p. 231.

This species is allied to *B. exilis*, but conspicuously different in the greater size, stronger cuticle, puckered striæ and color. The squarish form of the aperture and thickened lip are very similar to many Guadelupe specimens of *exilis*. Brown found it plentiful on the road from Roseau to Rosalie, 2000 ft. alt. It is said by Angas to be arboreal.

B. riisei (Pfeiffer). Pl. 14, figs. 1, 2; pl. 9, figs. 38, 39.

Shell *broadly and deeply umbilicated*, rather solid, ovate-conic, (white in its fossil condition); surface with low, irregular growth-wrinkles. Spire elevated, slender, pointed-conic, the apex slightly obtuse, nepionic whorls pit-reticulate. Whorls 6½ to over 7, moderately convex.

Aperture long-ovate, well rounded outwardly, flatter on the body side, varying from somewhat over to considerably less than half the total length of shell; peristome thin, slightly expanded, the ends converging; columellar lip produced forward nearly to the ventral level of body-whorl, broadly revolute, arching over the capacious umbilicus.

Alt. 35, diam. 16 mill.; alt. of aperture 16½ mill.

Alt. 27½, diam. 15 mill.; alt. of aperture 15 mill.

Alt. 22½, diam. 13 mill.; alt. of aperture 11½ mill.

Plantation 'La Grange' near Frederiksted, St. Croix, a pleistocene fossil.

Bulimus riisei Pfr., Malak. Bl. ii, 1856, p. 103, pl. 4, f. 7, 8.

The large umbilicus, greatly developed columellar lip and rather slender spire render this a peculiarly distinct species. The series of 32 examples before me show great variability in comparative length of spire and in the place of insertion of the inner lip, which is sometimes carried up near to the posterior angle of the aperture.

B. lehmanni (Pfeiffer). Pl. 9, figs. 40, 41, 42, 43.

Shell perforate, ovate-conic, *solid, opaque white*, more or less flesh-tinted. Surface slightly shining, irregularly and in general *coarsely and conspicuously plicate* longitudinally, showing under a strong lens faint, close spiral striæ. Spire conic, the apex obtuse, the nepionic whorls densely, minutely wave-wrinkled, the pattern more or less irregular and interrupted. Whorls 6½, moderately convex.

Aperture ovate, slightly oblique, white inside, less than half the length of shell; outer lip unexpanded, acute; columellar lip dilated and reflexed.

Alt. 19, diam. 9·3 mill.; alt. of aperture 9 mill.

Alt. 15, diam. 8·3 mill.; alt. of aperture 7·5 mill.

Alt. 18, diam. 8 mill.; alt. of aperture 7·8 mill.

Island of Anguilla (Swift, Rijersma); *St. Martin, at Simson Bay* (Maze).

Bulimus lehmanni Pfr., Malak. Bl., xii, 1865, p. 123; Novit. Conch., p. 281, pl. 69, f. 7, 8; Monogr. vi, 116.—*Bulimulus lehmanni* Pfr., Maze, Journ. de Conch., 1890, p. 25.

Distinct in its solid, opaque texture and coarse, more or less plicate surface sculpture. It varies somewhat in length of the spire, considerably in the prominence of the folds, and also in the size of the umbilicus. In the series of 51 Anguilla specimens before me, the umbilicus is almost closed in some examples, while others have it quite wide.

B. limnoides (Férussac). Pl. 9, figs. 59, 60.

Shell ovate-oblong, conoid, thin, pellucid, corneous, brown, smooth; spire acute; whorls a little convex, the last shorter than the spire, perforate at base; aperture ovate; lips thin, acute.

Shell medium sized, oval-oblong, swollen toward the base, the spire conic and pointed at the summit; whorls 7, flattened, sepa-

rated by a simple and superficial suture, regularly and quite rapidly widening; last whorl large, oval, obtuse below, nearly as high as the spire. External surface covered with fine, irregular striæ of growth, which by their number and arrangement give the shell the luster of satin, by reflected light. Coloration varies but little, the thin and transparent shell is of a quite dark uniform brown, slightly more intense at the apex; a whitish line at the suture. Aperture oval-oblong, russet-white within, dilated in front, contracted behind, but varying in form with age and in different specimens. Peristome whitish, quite thick, outwardly reflexed, of the same width almost throughout its extent. Columella short, dilated at base, whitish; parietal callus semitransparent, rather thin. Umbilical perforation very small, partly covered by the columellar reflexion. Large individuals measure: alt. 30, diam. 15 mill.

Guadelupe and St. Vincent (Fér.); *Guadelupe at Capesterre*, around the town (Mattei); *Baillif, riviere des Peres* (E. Marie); *St. Martin* (Van Rijersma).

Helix (*Cochlogena*) *limnoides* Fer., Prodr., p. 53, no. 393 (no description).—*Bulimus limnoides* Desh., in Lam., An. s. Vert., viii, p. 260; in Fér., Hist., p. 71, pl. 142, f. 9, 10.—Pfr., Monogr., ii, p. 224; Conchyl. Cab., p. 235, pl. 63, f. 3, 4.—*B. lymnoides* Reeve, Conch. Icon., pl. 70, f. 510.—*Bulimulus limnœoides* Alb.—*Bulimulus limnoides* Maze, Journ. de Conch., 1883, p. 20; J. de C., 1890, p. 26.—E. A. Smith, Proc. Malac. Soc. Lond., i, p. 305.

Probably does not occur outside of Guadelupe and dependent islets. I have not seen this species. It seems to be well distinguished from *B. chrysalis* Pfr., which is perhaps its nearest ally, by the wider expansion of the lip. The figures and description are from Férussac-Deshayes.

B. chrysalis (Pfeiffer). Pl. 9, figs. 50, 51.

Shell perforate, ovate-elongate, thin, pellucid, minutely striatulate, corneous-chestnut. Spire conic, acute; whorls 7 to 8, rather flat, the last about three-sevenths the total alt. Columella subvertical, rather straight, a little twisted.

Aperture colored like the outside, oval; peristome simple, acute, the right margin narrowly expanded, columellar margin dilated, spreading. Alt. 22, diam. 10 mill.; aperture 10 mill. long, 6 wide. (*Pfr.*).

Guadelupe (Petit de la Saussaie); *Martinique*, at Fort-de-France, 151 meters alt., and Massif des Pitons, 510–650 meters alt. (Mazé).

Bulimus chrysalis Pfr., Zeitsch. f. Mal., 1847, p. 14; Monogr. ii, p. 108; Conchyl. Cab., p. 238, pl. 63, f. 7, 8.—Reeve, C. Icon., f. 382.—Desh., in Fér. Hist., p. 71.—? *Helix limnoides var.* Fer., Hist., pl. 142, f. 11, 12.—*Bulimulus chrysalis* Maze, Journ. de Conch., 1874, p. 164.—Binney, Proc. Acad. Nat. Sci. Phila., 1874, p. 53 (dentition).

Very different from *B. limnoides* in the expanded peristome, not thickened within, according to Pfeiffer. Mazé did not find typical *chrysalis* in Guadelupe; a variety which he refers to that species occurred at many localities, but in my opinion it is not identical with Pfeiffer's species.

B. semicinctus Pilsbry, n. sp. Pl. 12, fig. 63.

Shell narrowly umbilicated, oblong-conic, thin and fragile. *Chestnut-brown with a pale peripheral line;* having faint growth-wrinkles and microscopic epidermal spirals. Spire conic, the apex obtuse, nepionic whorls forming an obliquely truncated pyramid, pitted-reticulate or wrinkled above. Whorls 5½, slightly convex, the last angulated in front, the angle soon disappearing.

Aperture oblique, somewhat over half the shell's length, narrowly ovate; peristome thin, the edge pale and a trifle everted, narrowly expanded, outer lip slightly sinuous, more strongly arcuate above; columella purplish, straight, its margin dilated, forming a convex arched roof over the perforation.

Alt. 19, diam. 9·7 mill.; alt. of aperture 10·1 mill.

Guadelupe (Marie, Schramm).

Bulimulus chrysalis var. β Maze, Journ. de Conchyl., 1883, p. 19.

The aperture is decidedly larger than in *B. chrysalis* Pfr., and the periphery is angular in front and marked with a pale line.

B. lherminieri (Fischer). Pl. 11, figs. 20, 21.

Shell oblong, *thin*, fragile, shining, corneous, longitudinally striated, spotted with *numerous white dots.* Whorls 5½, a little convex, the apex obtuse, sutures lightly impressed; the last whorl longer than the rest of the shell, tapering below.

Aperture elongate, ovoid; columella short, thin, roseate, not calloused; peristome arcuate, thin, simple, a little reflexed. Alt. 24, diam. 12 mill.; alt. of aperture 12 mill. (*Fisch.*).

Guadelupe; Mountains of Petit-Bourg, over 800 meters above sea-level (Dr. Lherminier); *Central cave at the N. E. of the plateau*, at about 1396 meters alt. (Comert).

Bulimus lherminieri FISCHER, Journ. de Conch., v (2d ser., i), April, 1857, p. 355, pl. 12, f. 6, 7.—PFR., Monogr., iv, p. 399.—*Bulimulus lherminieri* MAZE, Journ. de Conch., 1883, p. 17.

"A very rare species which to this time has been met with only on the leaves of the large Bromeliaceæ of the mountains (*Bromelia pinguin* L.), and on one occasion, at the margin of the great wood on the lower branches of one of the great forest trees.

"The shell is, as Fischer has described it, thin, shining, corneous, traversed horizontally by salient growth-striæ and marked with quite closely placed whitish dots, which become effaced with age, and finally almost wholly disappear. In life the shell is a beautiful reddish-brown, which changes to clear fawn after the death of the animal.

"The largest specimen collected measures 27 mill. long, 11½ wide; aperture 13 mill. long, 8½ wide."

It is extremely rare, according to Mazé, from whom the above notes are taken.

B. HOUELMONTENSIS Crosse. Pl. 9, figs. 45, 46.

Shell slightly rimate, oblong-elongate, scarcely shining, thin, translucent, of a pale chestnut color; spire moderately raised, the apex rather obtuse; suture impressed. Whorls 6, but slightly convex, the last about as long as the spire, attenuately rounded at base.

Aperture angulate-subovate, rather shining inside, colored like the exterior; peristome simple, the margins separated, columellar margin dilated, whitish-chestnut, nearly closing the umbilical chink; basal and outer margins rather acute. Alt. 15, diam. 7 mill.; alt. of aperture 7 mill. (*Crosse*).

Guadelupe, at Vieux-Fort, on the flank of Houelmont, 586 meters alt., under leaf rubbish (Bavay, Marie); also in the *Saintes* at *Marigot*, high land, under stones (Marie).

Bulimulus houelmontensis CROSSE, *MS.* in Mazé's Catal. Moll. terr. et fluv. Guad., Journ de Conch., xxxi, 1883, p. 19, pl. 1, f. 6; *t. c.* p. 43.

A slightly shorter specimen before me, collected by E. Marie, measures, alt. 14, diam. 7, alt. of aperture 7 mill. The surface shows very faint traces of fine, close epidermal spirals, as in *diaphanus* and other species of this immediate group. It is distinguished from others by the general proportions, aperture and diameter half the length of shell. The apex, as in *diaphanus*, has a densely punctate-reticulate sculpture.

B. FRATERCULUS ('Fér.' Potiez and Michaud). Pl. 11, figs. 24, 25.

Shell oval, oblong, perforate, fragile, fawn or clear corneous, transparent; longitudinally striated; the epidermis being a little lamellose, especially in young individuals, and these very fine and very caducious lamellæ cross the longitudinal striæ, thus rendering the shell a little rough to the touch. Spire composed of 5–6 whorls, the last larger than the rest taken together.

Aperture ovoid, angular above and slightly so below at the union of the outer and inner margins; peristome simple and sharp, a little reflexed only at the umbilicus. (*P. & M.*).

Alt. 12·3, diam. 5½ or 6 mill.; alt. of aperture 5·3 mill. (from the figures).

Guadelupe (Fér.).

Bulimus fraterculus Fér., POTIEZ & MICHAUD, Galerie des Moll. du Mus. de Douai, i, p. 141, and Atlas, p. 14, pl. 13, f. 7, 8 (1838). —? *Helix* (*Cochlogena*) *fraterculus* FER., Tabl. Syst., p. 54, no. 395. —*Conf.* PFR., Symbolæ ad Hist. Hel., ii, p. 46, no. 202.—? *B. fraterculus* Pfr., Monogr. Hel. Viv., ii, 220; Conchyl. Cab., pl. 49, f. 5, 6.—Probably not *B. fraterculus* RVE., C. Icon., pl. 63, f. 438.

This species may be compared, in miniature and as to contour only, with *B. guadalupensis* Lam. [*exilis* Gm.]. Its spire is shorter comparatively, and it cannot be taken for the young of that species. (*P. & M.*).

This species was not described by Férussac. The first description is that of Potiez and Michaud, and indicates a fragile brownish shell with spiral cuticular striæ, somewhat like *B. diaphanus* Pfr., but smaller and more pupiform. Pfeiffer, some years later, described a specimen from the Paris Museum, apparently Férussac's type, as follows:

"Shell perforate, oblong-ovate, pale corneous, lusterless; most minutely decussated with growth and transverse striæ; whorls 6, convex, the last a little shorter than the spire; aperture oblong-oval; peristome simple, thin, the right margin slightly expanded, columellar margin reflexed. Length 13, diam. 7 mill."

I have been unable to identify this species with any of the shells before me. The *B. fraterculus* of American collections, reported from Porto Rico, St. Kitts, St. Croix, Antigua, St. John, St. Thomas, Trinidad and Barbados, is not this species; so the localities cited by Pfr. in Monogr. viii, p. 189, and by Smith, Ann. Mag. (6), viii, on the authority of Bland, do not refer to the true *fraterculus*.

B. DIAPHANUS (Pfeiffer). Pl. 9, fig. 44.

Shell narrowly perforate, thin and fragile, *narrowly oblong-conic*, alt. more than double the diam.; corneous-brown (usually coated with closely adhering red earth), lusterless, the surface faintly striatulate, and spirally encircled with *numerous delicate unequal epidermal liræ*. Spire elevated, the apex obtuse, nepionic whorls *densely and minutely* pit-reticulated; whorls 6–6½, slightly convex.

Aperture ovate, about three-sevenths the total alt., corneous-brown inside; outer lip thin, unexpanded and fragile; columella slightly concave, the columellar lip convexly dilated and reflexed above.

Alt. 16, diam. 7·2 mill.

Alt. 15, diam. 7 mill.

St. Thomas (Bland); *Arecibo, Porto Rico* (Bld.); *St. Eustatius* (Dr. Cleve); *Saba* (Ober, 1880); *Barbados* (Miss Foderougher, in Swift Coll.).

Bulimus diaphanus PFR., P. Z. S., 1854, p. 125; Monogr., iv., p. 505.

Quite fragile and slender, but less elongated than *B. mazei* Crosse. The apical sculpture is very fine. The Saba, St. Eustatius and Barbados specimens agree in every respect with those from St. Thomas. Specimens from Porto Rico, which I can only refer to this species, vary from typical to decidedly wider; selected examples measuring as follows:

Alt. 14·8, diam. 7·3; alt. of aperture 6·2 mill.

Alt. 13·3, diam. 7·5; alt. of aperture 6·7 mill. (immature).

B. MARTINICENSIS (Pfeiffer). Pl. 9, figs. 47, 48, 49.

Shell rimate-perforate, oblong-turrited, obliquely striatulate, rather solid, yellowish-corneous. Spire turrited, a little obtuse; whorls 7, convex, the last slightly over one-third the length of shell. Aperture ovate-oblong, peristome narrowly expanded, white-lipped within, the lip outwardly pellucid, margins somewhat converging, the right margin arcuate, columellar margin dilated. Alt. 20, diam. 8 mill.; aperture 7⅔ mill. long; 5 wide (*Pfr.*).

Martinique, at Massif des Pitons, alt. about 560 meters, in very shady places under leaves (Mazé).

Bulimus martinicensis PFR., P. Z. S., 1846, p. 40; Monogr., ii, p. 120; Conchyl. Cab., p. 238, pl. 63, f. 9, 10.—REEVE, Conch, Icon., pl. 63, f. 434.—*Bulimulus martinicensis* MAZE, Journ. de Conch., 1874, p. 164.

Seems nearly allied to *B. diaphanus*, but no cuticular spirals are mentioned by Pfeiffer.

B. MAZEI Crosse. Pl. 9, figs. 57, 58.

Shell partly covered subrimate, *elongated*, turriculate, quite thin, under the lens seen to be delicately, somewhat obliquely striated; deep brown. Spire elevated, the apex rounded and rather obtuse, slightly pitted in the middle; suture impressed. Whorls 7, a little convex and slowly widening, the earlier 2 paler, the last very obtusely subangular at the periphery, the angle disappearing toward the lip-edge.

Aperture subvertical, less than half the total length, angular-ovate, brown within; peristome simple, the margins distant, columellar margin dilated and reflexed, whitish-brown, almost wholly covering the umbilical chink; basal and outer margins rounded and acute. Alt. 19, diam. 7 mill.; aperture 6½ mill. long, 4 wide (*Crosse*).

Massif des Pitons, Martinique, 730 meters above the sea level (Mazé), on damp moss at the bases of trees.

Bulimulus mazei CROSSE, Journal de Conchyl., xxii, 1874, p. 118, 202, pl. 4, f. 3.—MAZE, *t. c.* p. 165.

The soft parts are black. The form is decidedly more slender than in *B. diaphanus* or other allied species, and the aperture hardly over one-third of the total length of the shell.

B. BARBADENSIS (Pfeiffer). Pl. 12, fig. 61.

Shell barely perforate or narrowly umbilicated, ovate-conic, thin and fragile, uniform russet-brown. Surface hardly or somewhat shining, with slight and inconspicuous growth-wrinkles and excessively faint cuticular spirals, obsolete on the base and sometimes scarcely visible on any part of the shell. *Spire straightly conic*, the apex obtuse, nepionic whorls densely and minutely zigzag-wrinkled. Whorls 5½, slightly convex, the last regularly convex.

Aperture somewhat oblique, *almost exactly half* the shell's length or slightly exceeding that, ovate; peristome thin, the outer lip not appreciably sinuous or expanded; columellar lip dilated, generally almost closing the perforation.

Alt. 20·7, diam. 11 mill.; alt. of aperture 11·2 mill.

Alt. 20·2, diam. 10 mill.; alt. of aperture 10·5 mill.

Barbados (Bland, Guilding, Pfr.); *Grenada* (Smith).

Bulimulus fuscus GUILDING, Zool. Journ. iv, p. 170 (insufficient description).—*Bulimus barbadensis* PFR., P. Z. S., 1852, p. 61; Monogr., iii, p. 435.—*B. tenuissimus* Fér., SMITH, Ann. Mag. N. H. (6), viii, p. 252; Proc. Malac. Soc. i, p. 316.

Several trays of this species before me, part collected by Thomas Bland, agree well in characters, though some are slightly stouter than others. It is larger than *B. houelmontensis*, with more straightly conic spire. In *B. semicinctus*, also closely allied, the periphery is subangular in front and begirt with a pale band, the aperture is larger, outer lip somewhat sinuous with everted edge, etc. Evidence that this species occurs on the mainland is still lacking.

Whether Férussac's *B. tenuissimus* was the Barbados shell with a wrong locality label is doubtful; I am disposed to consider it a continental form; but it must freely be granted that the identification of these thin brown and corneous Bulimuli is an excessively difficult task, and almost impossible when the localities of the species or specimens are unknown. The first description of *tenuissimus* pertained to the Brazilian shell so called by d'Orbigny, and it is to this form that the name must belong.

B. STENOGYROIDES Guppy. *Unfigured.*

Shell rimate, turrited, elongate cylindrical, scarcely shining, whitish-horn colored under a brown epidermis, striæ of growth somewhat sinuate; whorls (? about 5 or 6), little convex, the last narrow and forming half or more of the length of the shell. Aperture long-oval, narrow, rather produced anteriorly; peristome simple, a little effuse anteriorly, acute, the margins joined by a thin callus; columella reflexed over the narrow umbilical fissure.

Alt. ?, diam. 5½ mill.; alt. of aperture, 6; width, 2½ mill.; alt of last whorl, 10 mill. (*Guppy*).

Island of Dominica (Guppy).

Bulimulus stenogyroides GUPPY, Ann. Mag., N. H. (4), i, 1868, p. 431.—*B.* (*Peronœus*) *stenogyroides* SMITH, Ann. Mag. N. H. (6), ii, p. 231.—*Bulimus stenogyroides* Pfr., Monogr., viii, p. 132.

Pfeiffer and Smith add nothing to Guppy's description of a single broken specimen, by which alone the species is thus far known. It probably belongs to the Stenogyroid series.

B. SEPULCRALIS Poey. Pl. 12, fig. 62.

Shell narrowly umbilicated, oblong-conic, thin; smooth, with slight growth-wrinkles but no spiral striæ. Brownish-corneous,

sometimes with a pale peripheral line. Spire conic, the apex obtuse, nepionic whorls smooth in most adult shells, but the young show an excessively fine, shallow pit-reticulation. Whorls 5½–6, quite convex, the sutures deeply impressed.

Aperture ovate, contained about 2¼ times in length of shell; outer lip regularly arcuate, acute, thin and unexpanded; columellar lip dilated above partly over the well-marked umbilicus.

Alt. 14, diam. 6–7 mill.; alt. of aperture 6 mill.

Alt. 9·5, diam. 5 mill.; alt. of aperture 4·2 mill.

Alt. 10, diam. 5·7 mill.; alt. of aperture, 4·5 mill.

Havana and its environs, Cuba (Poey, Arango, Baker, *et al.*); *New Providence, Bahamas* (Swift, Bland, Bendall).

Bulimulus sepulcralis Poey, Memorias sobre la Hist. Nat. de Cuba, ii, p. 203, pl. 12, f. 27–29 (*B. urinarius* Poey mss. to some collectors); also note 25, on p. 453.—Pfr. in Conchyl. Cab., p. 162, pl. 49, f. 3, 4; Monogr. iii, p. 438.—Arango, Contrib. Fauna Malac. Cubana, p. 80.—*Bulimulus sepulcralis* Pfr., Mal. Bl., 1854, p. 195. —Bendall, Proc. Malac. Soc. Lond., i, p. 293.

This species is closely allied to the forms of Yucatan and Central America, not to the group inhabiting from Trinidad to Haiti. It is undoubtedly a comparatively recent importation from the middle American mainland, and its distribution suggests that its presence in the Antilles may date only from the early days of Spanish commerce in America. It presents differences from the closely allied *B. unicolor* which are probably specific, though not very conspicuous. *B. sepulcralis* seems to be singularly restricted in distribution, being found only in the immediate vicinity of Havana, especially in cemeteries and on fortification walls. Bendall says it is abundant on damp ground at New Providence. It occurs near Nassau.

New Providence specimens are sometimes larger than any of the extensive series I have seen from Cuba—16 mill. long,—and the spire is generally more straightly conic, turrited; whorls 6½.

Central American Species.

The forms of this region are closely allied to those of Colombia and to *B. sepulcralis* of Cuba. Apical sculpture generally very indistinct, occasionally with spiral striæ as well as longitudinal wrinkles; but these are more pronounced in some of the South American forms; surface nearly smooth, with faint spirals in some species.

a. Small species, alt. less than 20 mill.

b. Very slender; diam. less than half the alt.; aperture about one-third alt. *inermis.*

bb. Stouter; diam. and aperture not far from one-half the alt.

c. With delicate epidermal spirals.

d. A chestnut band above sutures on spire, *coriaceus.*

dd. Uniform flesh-colored, *sarcodes.*

cc. No perceptible spiral sculpture. *umbraticus, unicolor, corneus.*

aa. Larger species, alt. 23–27 mill.; diam. and aperture slightly less than one-half the alt.; spire straightly conic, *dysoni.*

B. INERMIS (Morelet). Pl. 10, fig. 87.

Shell narrowly and profoundly umbilicated, elongate-conic, rather thin, minutely striated, a little shining; covered with a very thin, pale, brownish-corneous epidermis. Spire long, the apex rather obtuse; suture profoundly impressed. Whorls 7, little convex, the two embryonal smooth and corneous, the last much shorter than the spire, attenuated at base, rounded; columella nearly straight, whitish. Aperture acuminate-oval, colored like the exterior; peristome simple, the terminations separated, columellar margin vaultingly reflexed, partially covering the umbilicus, basal and outer margins acute. Alt. 9, diam. 4; alt. of aperture 3, width 1½ mill. (*C. & F.*).

Environs of the town, Palizada, Yucatan (A. Morelet).

Bulimus inermis MOREL., Testacea Noviss., ii, p. 10 (1851).—PFR., Monogr., iii, p. 441; iv, p. 506; vi, p. 153.—*Bulimulus* (*Leptomerus*) *inermis* CROSSE & FISCHER, Miss. Sci. Mex. et Amér. Centr., p. 550, pl. 20, f. 16, 17.—MARTENS, Biol. Cent. Amer., p. 241.

One of the smallest Central American species, further remarkable for its elongation, the aperture being only one-third the total alt. Crosse & Fischer's description and figures, given above, are from Morelet's types. I have not seen the species.

A var. *major*, alt. 13½, diam. 6, alt. of aperture 5 mill., from N. Guatemala is mentioned by v. Martens.

B. CORIACEUS (Pfeiffer). Pl. 10, figs. 79, 80 (77, 78, berendti).

Shell perforate, ovate, thin, light brown, *the whorls of the spire with a chestnut band above the sutures*, fading on its upper margin; apex purple-brown or brown. Surface lusterless except just in front of aperture, showing under the lens faint growth wrinkles and

very close, fine epidermal spiral striæ. Spire conic, the apex obtuse, nepionic whorls superficially and microscopically granose-wrinkled and spirally incised-striate. Whorls about 5½, slightly convex, the last large, rounded.

Aperture ovate, about one-half the shell's length, outer lip acute and not expanded, columellar lip reflexed and dilated above.

Alt. 14, diam. 8·2 mill.; alt. of aperture 7 mill. (specimen).

Alt. 18, diam. 9 mill.; alt. of aperture 8¾ mill. (*Pfr.*).

Cordova, State of Vera Cruz (Sallé); *Orizaba* (Hegewisch, Berendt and others), *Mexico.*

Bulimus coriaceus PFR., P. Z. S., 1856, p. 318; Monogr., iv, p. 504.—*Bulimulus coriaceus* CR. & FISCH., Moll. Terr. et Fluv. Mex., p. 552, pl. 21, f. 7, 7a.—MARTENS, Biol. Cent. Amer. p. 248.—*Bulimus behrendti* PFR., Malak. Bl., viii, 1861, p. 168.—*Bulimus berendti* PFR., *t. c.*, pl. 3, f. 4, 5; Monogr. vi, p. 149.—*Bulimulus coriaceus* var. *berendti* MARTENS, Biol. Centr. Amer., p. 249.—Not *B. berendti* CR. & F., Moll. Mex., p. 554, pl. 21, f. 8, 8a.

The chestnut band (fading on its upper edge into the light ground-color) above the sutures of the whorls of the spire, and the stout contour are good specific marks of this species, which is quite distinct and easily recognized for a *Leptomerus.*

Von Martens is doubtless correct in uniting *berendti* to *coriaceus.* A good series of both, including part of the original lot of *coriaceus* collected by Sallé, and numerous *berendti* from Orizaba, the type locality, does not permit me to separate the two even as varieties.

Specimens labelled "Guatemala, Sarg" are also before me.

B. UMBRATICUS (Reeve). Pl. 10, fig. 88.

Shell subperforate, ovate-conic, rather thin, striatulate, somewhat pellucid, whitish, somewhat streaked with brown above. Spire long-conic, rather acute. Whorls 6, a little convex, the last about four-ninths the total length, rotund at base. Columella arcuate, somewhat twisted above; aperture oblique, oval; peristome simple, unexpanded, the right margin lightly arcuate, columellar margin dilated, reflexed and subappressed. Alt. 15½, diam. 8 mill.; aperture 7½ mill. long, 4 wide (*Pfr.*).

Central America (Cuming Coll.).

Bulimus umbraticus RVE., Conch. Icon., pl. 77, f. 559 (August 1849).—PFR., Monogr., iii, p. 414.

"Transparent white streaked with pale brown near the apex. It is possible that this may be a light variety of a species of more color, from the indications of marking near the apex" (*Rve.*).

B. UNICOLOR (Sowerby). Pl. 10, fig. 73.

Shell perforate, ovate-conic, more or less elongated, thin, corneous-brown. Surface slightly shining, with slight growth-wrinkles. Spire of a little over 5½ whorls, the apex obtuse; nepionic whorls minutely, shallowly wrinkle-granose and spirally striated. Whorls convex, the last well rounded; sutures impressed. Aperture ovate, brownish inside; outer lip unexpanded, acute; columellar lip dilated and reflexed above.

Alt. 15½, diam. 8 mill.; alt. of aperture 7 mill. (Panama).

Alt. 15, diam. 7 mill.; alt. of aperture 6¼ mill. (Labna).

Alt. 14, diam. 7½ mill.; alt. of aperture 6⅔ mill. (Labna).

Perico Island, Bay of Panama, on dead leaves (Cuming); *Greytown, Nicaragua* (R. Tate); *Istapa, Pacific coast region of S. Guatemala,* in forest (Morelet, for var. *istapensis*); *Northern Yucatan, at Progreso, Tekanto, Sitilpech, Tunkas, Calcehtok, Ticul, Tabi, Uxmal and Labna* (Heilprin, Baker, Stone, Ives, see Proc. A. N. S., Phila., 1891, p. 310).

Bulinus unicolor SOWB., P. Z. S., 1833, p. 73; Conchol. Illustr., f. 43.—*Bulimus unicolor* DH. in Lam., An. s. Vert., viii, p. 280.—PFR., Monogr., ii, p. 219; Conchyl. Cab., p. 234, pl. 62, f. 41, 42.—REEVE, Conch. Icon., v, pl. 21, f. 133.—*Bulimulus* (*Leptomerus*) *unicolor* v. MART. in Alb., Die Hel., p. 222; Biol. Centr. Amer., Moll., p. 247 (including *petenensis* and *istapensis* as varr.).—Not *Bulimus corneus* Lea.—? *B. berendtii* CROSSE & FISCHER, Moll. Mex., p. 554, pl. 21, f. 8, 8a.

This species varies much in degree of elongation and in size, and has no prominent specific characters. It is more slender than *B. coriaceus,* and lacks chestnut color on the spire.

Sowerby's original description is as follows: Shell oblong, corneous, thin, the apex obtuse; whorls 6, ventricose, striated, with distinct sutures; aperture ovate, the margin thin, acute; umbilicus small. Length 0·8, diam. 0·3 inch (= 20, 7½ mill.).

This indicates a somewhat larger shell than the specimens I have seen.

Var. ISTAPENSIS Cr. & Fisch. Pl. 10, fig. 81.

Shell nearly covered umbilicate, ovate-elongate, thin, minutely and subobliquely striated, shining, dull whitish-hyaline; spire sub-

elongate-conic, the apex a little obtuse; suture impressed. Whorls 6, slightly convex, the last a little shorter than spire (6½ : 8), somewhat attenuated at base, rounded. Aperture acuminate-oval, colored like the outside; peristome simple, unexpanded, the columellar margin dilated, whitish, nearly closing the umbilical fissure; basal and outer margins acute. Alt. 14½, diam. scarcely 7 mill.; alt. of of aperture 6½, width 4 mill. (*C. & F.*).

Variety: a little smaller, corneous-hyaline, encircled by inconspicuous, interrupted, whitish-hydrophanous lines. Alt. scarcely 12, diameter 6 mill. (*C. & F.*).

Bulimulus istapensis C. & F., Journ. de Conch., xxi, 1873, p. 286; Moll. Terr. et Fluv. Mex., p. 549, pl. 20, f. 18.—*B. unicolor* var. *istapensis* MARTENS, Biol. Centr. Amer., Moll., p. 248.

The large series of specimens from numerous localities in northern Yucatan, which I refer to this species, are a variety probably near to, if not identical with, *istapensis*. The shells when fresh are brown or corneous-brown, but soon weather to whitish or corneous hyaline. In almost every locality the slender and stouter forms occur together, and with intermediate specimens.

Var. PETENENSIS (Morelet). Pl. 10, fig. 82.

Shell larger, whitish with oblique streaks of brown or purple; spire darker, becoming purple toward the apex. Whorls 6.

Alt. 18, diam. 9 mill. (specimen from Morelet).

Alt. 19, diam. 8 mill.; aperture 8½ mill. long (type).

Peten, north Guatemala, on blades of grass in open savannas (Morelet).

Bulimus petenensis MOREL., Testac. Noviss., ii, p. 10.—*Bulimulus petenensis* C. & F. *t. c.* p. 553, pl. 20, f. 13.—*B. unicolor* var. *petenensis* MARTENS *t. c.* p. 248.

More opaque than the preceding, somewhat larger, with the earlier whorls deep purple.

B. CORNEUS (Sowerby). Pl. 10, fig. 68.

Shell narrowly umbilicated, ovate-conic, thin, uniform dull brown or corneous-brown; but little shining. Surface smoothish, with light growth-wrinkles. Spire conic, the apex obtuse, nepionic whorls obsoletely wrinkle-granose. Whorls 5½ to 6, moderately convex, the last ventricose.

Aperture irregularly ovate, subvertical, about half the length of the shell; peristome thin, simple, the columella arcuate, columellar margin dilated and reflexed above.

Alt. 15, diam. 9, alt. of aperture 7½ mill. (Polvon, Nicaragua).

Alt. 15½, diam. 8, alt. of aperture, 7¾ mill. (Polvon, Nicaragua).

Alt. 14, diam. 7, alt. of aperture 6⅓ mill. (*Pfr.*).

Alt. 0·6, diam. 0·3 inch (*Sowb.*).

Belize River, British Honduras (Berendt); *Guatemala: Retalhuleu, on the lowlands of Pacific slope* (Stoll); *Escuintla, on Pacific slope* (Morelet); *Zacapa, E. Guatemala, on cacti* (Stoll); *Realejo, under decayed grass, N. W. Nicaragua* (Cuming); *San Juan, Castillo and Toro Rapids* (Gabb), *and San Juan River* (Tate), *S. E. Nicaragua; Guanacasta, N. W. Costa Rica* (Pittier); *Puerto Viejo, on the Rio Sarapiqui, N. E. Costa Rica* (Biolley); *central Costa Rica at Las Palmares, Prov. Alajuela* (Orosco); *San Jose* (Biolley); *Tilorio and Zhorquin Rivers, E. Costa Rica* (Gabb).

Bulinus corneus Sowb., P. Z. S., 1833, p. 37 (published May 17, 1833; see P. Z. S., 1893, p. 436).

Bulimus corneus Pfr., Monogr., ii, p. 219; Conchyl. Cab., p. 242, pl. 63, f. 29, 30.—Reeve, Conch. Icon., pl. 21, f. 134.—Angas, P. Z. S., 1879, p. 479. Not *Bulimus corneus* Lea, 1838, nor of Desh., 1833, Michaud, 1858, or Menke, 1830.

Bulimulus (*Leptomerus*) *corneus* Sowb., Martens in Die Hel., edit. 2, p. 222; Biol. Centr. Amer., p. 246, pl. 15, f. 9 (living animal).—Crosse & Fischer, Moll. Mex., i, p. 548.—*Bulimulus corneus* Binn. & Bld., Proc. A. N. S. Phila., 1873, p. 248.—*Leptomerus corneus* Binn., Ann. N. Y. Acad. Sci., iii, p. 124 (jaw and dentition).—*Bulimus berendti* Pfr., Tate, Amer. Journ. Conch., 1870, p. 156.—Binney, Amer. Journ. Conch., vii, 1872, p. 182 (jaw and radula). Not *B. berendti* Pfr.

A decidedly stouter species than *B. unicolor*, to which it is otherwise allied.

Var.? nubeculatus (Pfr.). Pl. 10, figs. 69, 70.

Shell umbilicate, ovate-oblong, rather solid and smooth, shining; pale corneous clouded with darker; spire conic, the apex rather obtuse; suture deep; whorls 5½, convex, the last three-sevenths the total alt., rotund at base; columella vertical, produced or projecting at the base of the aperture. Aperture little oblique, subelliptical, subangular at base, white inside; peristome simple and unexpanded,

the right margin strongly arched, columellar margin dilated and reflexed, free. Alt. 16, diam. 8½ mill.; alt. of aperture 7½ mill. (*Pfr.*).

Central America (Morelet in Cuming Coll.).

Bulimus nubeculatus Pfr., P. Z. S., 1851, p. 257; Monogr., iii, p. 438; Conchyl. Cab., p. 92, pl. 31, f. 15, 16.

Considered a variety of *corneus* by von Martens (who apparently had not seen specimens), and on his authority so treated here. Its main differential characters are the clouded coloration and produced, subangular basal lip.

Var. minor v. Mart. Pl. 10, figs. 71, 72.

Shell one-colored, grayish-corneous, similar to *B. corneus* but smaller. Alt. 12, diam. 8; alt. of aperture 7 mill.

San Andres Tuxtla, near Vera Cruz, E. Mexico (Sallé).

Bulimulus (*Leptomerus*) *nubeculatus* Pfr., Crosse & Fischer, Moll. Mex., i, p. 556, pl. 24, f. 7, 7*a*.

On account of its locality, the specific relationship of this form to *corneus* or *nubeculatus* is by no means certain; it may be a form of *coriaceus*.

B. sarcodes (Pfeiffer). Pl. 10, figs. 74, 75, 76.

Shell openly perforate, oblong conic, thin, striatulate, very obsoletely decussated with spiral lines under the lens, flesh colored. Spire conic, rather acute. Whorls 6, a little convex, the last about four-ninths the length of shell. Columella lightly arcuate. Aperture oval, shining inside, the peristome unexpanded and acute, right margin arcuate, columellar margin dilated, vaultingly spreading. Alt. 17½, diam. 8 mill.; aperture 8 mill. long, 4⅓ wide. (*Pfr.*).

Honduras (Dyson).

Bulimus sarcodes Pfr., P. Z. S., 1846, p. 30; Monogr., ii, p. 220; Conchyl. Cab., p. 233, pl. 62, f. 39, 40.—Reeve, Conch. Icon., pl. 61, f. 414.

No later authors have added anything to Pfeiffer's original description of this species, which has not occurred to other collectors. It differs from *B. unicolor* in having faint spiral lines, or "delicate impressed striæ." "It is an extremely delicate, transparent shell" according to Reeve.

B. dysoni (Pfeiffer). Pl. 10, fig. 83.

Shell perforate, oblong-conic, quite thin and somewhat transparent; corneous brown; surface somewhat shining, with slight growth-

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wrinkles and an appearance of very faint spiral striæ below the sutures, which are but little impressed and under a lens seem to be very narrowly margined by transparence. Spire rather straightly conic, the apex obtuse, nepionic whorls with shallow, fine, short-waved interrupted and dislocated wrinkles, and slight, fine, impressed spiral striæ. Whorls 6½, weakly convex, the last obsoletely angular at the periphery.

Aperture rather narrowly ovate, brownish-corneous inside, decidedly less than half the length of the shell; peristome thin and unexpanded; columella slightly concave, the columellar margin dilated and reflexed above.

Alt. 27, diam. 12⅓; alt. of aperture 12½ mill.

Alt. 23½, diam. 10; alt. of aperture 9¾ mill.

Alt. 20, diam. 9½; alt. of aperture 9 mill. (type).

Alt. 25, diam. 11; alt. of aperture 10¾ mill.

Honduras (Dyson); *Nicaragua* (Swift. Coll.); *around Duenas, Guatemala* (Salvin); *Yucatan* (Martens).

Bulimus dysoni Pfr., P. Z. S., 1846, p. 39; Monogr., ii, p. 183.—Reeve, Conch. Icon., pl. 62, f. 425.—*Bulimulus dysoni* Crosse & Fischer, Moll. Terr. et Fluv. Mex., p. 551.—Martens, Biol. Amer. Centr., p. 241.

The columella may be faintly seen through the shell in clean examples, as Reeve has already remarked. The spire is rather straight, whorls but little convex, and the last one is obsoletely angled, the angle most visible ventrally, where it arises exactly at the upper insertion of the outer lip. The appearance of spiral striation is like that of *B. cacticolus*, and depends on some structural character of the shell-substance rather than on an actual sculpturing of the surface. There is a considerable range of variation in the length of spire, as usual in *Bulimulus*, some specimens, like that last measured above, having it quite long. The apical sculpture is like that of *cacticolus*.

A tray of 8 specimens from Cuidad Bolivar, Venezuela, shows no material variation from the Central American shells. They are slightly more opaque and of a trifle redder tint. The locality datum can hardly be questioned, as the original label accompanies the shells.

Var. ignavus Reeve. Pl. 10, fig. 86.

Shell oblong-ovate, rather deeply umbilicated, whorls 7, rounded, longitudinally very finely striated; columella broad, slightly re-

flected, lip simple. Dirty horn color. A thin horny shell with the whorls somewhat rounded and rather deeply umbilicated (*Reeve*).

Central America (Cuming coll.); *Campeche* (A. Sallé); *and Palizada* (Morelet), *Yucatan.*

Bulimus ignavus Rve., Conch. Icon., pl. 77, f. 562 (Aug., 1849). —*B. dysoni* var. B. Pfr., Monogr., iii, p. 438.

B. ignavus is considered by Pfeiffer, Crosse and Fischer and von Martens a var. of *dysoni* characterized by the smaller, more fragile shell, with the basal angle less conspicuous. Alt. 9, diam. 4½ mill. A specimen collected by Sallé is figured by Crosse & Fischer (see pl. 10, figs. 84, 85). I am disposed to think that *ignavus* is as distinct from *dysoni* as most of the middle American species of *Leptomerus* are from one another.

Species of northwestern South America.

Not different in general features from the forms of Central America or eastern S. America.

a. With minute spirals; pale corneous-brownish or yellowish.
b. Large, alt. 22–32 mill.; whorls 6½–7, *cacticolus, erectus.*
bb. Small; whorls 5½; fine epidermal spirals, *buenavistensis.*
aa. Without spiral striæ.
b. Diameter less than half the alt.
c. Alt. 20 mill.; aperture ½ alt.; whorls 6½; pale reddish-corneous, *juvenilis.*
cc. Alt. 21 mill.; aperture nearly ½ alt.; whorls 7; rugulose-striate; pellucid straw-whitish, *glandiniformis.*
ccc. Long, rather solid, white; whorls 7½–8; aperture contained 2½ times in alt., *krebsianus.*
cccc. Alt. 13½; ovate, smooth, corneous; whorls 6–7; aperture ⅔ of alt., *fontainii.*
ccccc. Alt. 17½, aperture 8 mill. long; striatulate, pale corneous, perforation minute; whorls 6, *molecillus.*
bb. Diameter equal to or exceeding half the alt.
c. Alt. 17, diam. 10, length aperture 10 mill.; globose-conic, pale grayish-tawny; whorls 4½, *marmatensis.*
cc. Alt. 12½, diam. 7½, aperture 6 mill.; subhyaline; whorls 5, *hyaloideus.*
ccc. Alt. 13, diam. 6½, aperture 6 mill.; corneous-whitish, smooth; whorls 5½, *ucayalensis.*

B. BUENAVISTENSIS Pilsbry, n. n. Pl. 10, fig. 95.

Shell small, narrowly umbilicated, ovate-conic, thin, light corneous-brown. *Surface lusterless*, to the sight and touch like velvet with excessively short pile; the growth lines inconspicuous, but showing under the lens *very fine raised cuticular spirals* throughout, subregularly and very closely placed. Spire conic, the apex obtuse, the earlier 1⅔ whorls, very densely, finely granose in zigzag-wrinkled pattern. Whorls 5½, moderately convex, the last with the *appearance* of being subangular in front of aperture, but there is almost no actual angle.

Aperture slightly oblique, elliptical, narrowed above and below, colored like the outside, a trifle less than half the shell's length; peristome thin, acute and unexpanded, outer lip quite regularly arcuate, in profile view its upper fourth seen to be produced forward; columella straight, the columellar margin dilated above.

Alt. 11·4, diam. 6·3; alt. of aperture 5·4 mill.

Buenavista, Colombia (T. R. Peale).

Bulimus corneus LEA, Trans. Amer. Philos. Soc., vi, 1836, p. 66, pl. 23, f. 111 (June, 1838; see Proc. Amer. Philos. Soc., i, 1838, p. 19); Observations on the Genus Unio, etc., ii, p. 66, pl. 23, f. 111 (1838). Not *Bulimus corneus* Desh., 1836, nor of Sowerby, 1833.

Lea's figure and measurements were from a larger specimen ("length 0·7 of an inch") than that preserved in his cabinet, from which my description and figure are drawn.

It is not, as Pfeiffer stated with doubt (Monogr., ii, p. 219), a variety of *B. unicolor*, differing radically from that species in sculpture; and it is equally distinct from other small species of northwestern S. America and Central America, none of which have the characteristic cuticular spirals of Lea's *B. corneus*. Among the Antillean species *B. diaphanus* has more prominent growth-wrinkles; and in *B. houelmontensis* the body-whorl is much more oblong and the sutures deeper.

Type is No. 105078 U. S. Nat. Mus.

B. JUVENILIS (Pfeiffer). *Unfigured.*

Shell perforate, ovate-fusiform, thin, lightly striatulate, hardly shining, pale reddish-corneous. Spire long-conic, the apex rather acute. Whorls 6½, but slightly convex, the last a little shorter than the spire, obsoletely subangulate in the middle, the base attenuated; columella somewhat straightened, a little receding. Aperture oblique,

oval-elliptical, subangulate at base; peristome simple, unexpanded, dilated above, vaultingly reflexed. Alt. 20, diam. 8½ mill.; aperture 10 mill. long, 5 wide. (*Pfr.*).

Santa Fe de Bogota (Cuming coll.).

Bulimus juvenilis Pfr., P. Z. S., 1855, p. 97; Monographia, iv, p. 503.

May be a form of *B. dysoni*, such as the Venezuela specimen mentioned above.

B. cacticolus (Reeve). Pl. 10, figs. 89, 90.

Shell umbilicated, ovate-pyramidal, thin; uniform dull buff; lusterless; the surface nearly smooth, but having slight growth-wrinkles and fainter spirals around the top of the whorls. Spire elevated conic, the apex obtuse, nepionic whorls with fine and shallow, interrupted, short-waved corrugation and faint incised spiral lines. Whorls 6½, convex; last whorl inflated.

Aperture ovate, rounded below, whitish-brown inside, less than half the length of shell; outer lip thin, sharp and unexpanded; columellar lip dilated.

Alt. 32, diam. 18 mill.; alt. of aperture 15 mill.

Alt. 33, diam. 17 mill.; alt. of aperture 15½ mill.

Alt. 25, diam. 12½ mill.; alt of aperture 13½ mill. (type).

Curiana, on cacti (Dyson) and on the *Yaracuy River* (John Hillyer), *Venezuela*.

Bulimus cacticolus Rve., Conch. Icon., pl. 58, f. 393 (Jan., 1849). —Pfr., Monogr., iii, p. 439.—*Otostomus* (*Leptomerus*) *cacticolus* Rve., Marts., Binnenmoll. Venez., p. 31.

B. cacticolus is the largest species of this section, and may readily be known by its size, dull buff color, thin but not fragile shell, rather open umbilicus, etc. The following species seems to me to be merely a slender form of *cacticolus*, differing somewhat in the more conspicuous spiral striæ. As I have not seen the type, it may stand here provisionally.

B. erectus (Reeve). Pl. 10, fig. 99.

Shell openly perforate, ovate-turrited, thin, subrugate, closely sculptured with spiral impressed lines, subpruinosa, pale corneous; spire erect, rather acute; whorls 7, a little convex, the last shorter than the spire, slightly compressed at base. Columella lightly arcuate. Aperture subvertical, oblong-oval; peristome simple, unex-

panded, the right margin regularly arcuate, columellar margin vaultingly reflexed. Alt. 22½, diam. 11 mill.; alt. of aperture 11, width 6 mill. (*Pfr.*).

Curiana, Venezuela, on cacti (Dyson).

Bulimus erectus REEVE, Conch. Icon., pl. 58, f. 392 (Jan. 1849).—PFR., Monogr., iii, p. 439.

"Of a uniform horn color, with peculiarly erect spire" (*Rve*). Seems to differ from *B. cacticolus* only in being somewhat more slender, with stronger longitudinal and spiral sculpture. The name *erectus* has precedence on Reeve's pages.

B. MARMATENSIS (Pfeiffer). *Unfigured.*

Shell perforate, globose-conic, thin, striatulate, pellucid, pale grayish-tawny. Spire conic, rather obtuse. Whorls 4½, moderately convex, the last slightly longer than the spire, rounded. Columella lightly arcuate. Aperture little oblique, rotund-oval; peristome simple, unexpanded, the right margin very arcuate, columellar margin dilated above, reflexed, vaulted over the narrow perforation. Alt. 17, diam. 10 mill.; aperture 10 mill. long, 7 wide. (*Pfr.*).

Marmato, U. S. of Colombia (Cuming Coll.).

Bulimus marmatensis PFR., P. Z. S., 1854, p. 125; Monogr., iv, p. 501.

B. HYALOIDEUS (Pfeiffer). *Unfigured.*

Shell narrowly umbilicate, ovate-conic, thin, irregularly striatulate, somewhat hyaline; spire regularly conic, the apex rather acute. Whorls 5, convex, the last a little shorter than the spire, with rounded base. Aperture little oblique, rounded-oval; peristome simple, acute, the margins approaching, right margin unexpanded, very arcuate, columellar margin arcuate, somewhat spreading. Alt. 12½, diam. 7½ mill.; aperture 6 mill. long, 4 wide. (*Pfr.*).

Mendez, in the Andes of Colombia (Cuming Coll.).

Bulimus hyaloideus PFR., P. Z. S., 1854, p. 292; Monogr., iv, p. 505.

May be allied to *B. guttula* Pfr.

B. GLANDINIFORMIS Sowerby. Pl. 10, figs. 93, 94.

Shell narrowly perforate, oblong, very thin, shining, pellucid, straw-whitish; longitudinally rugulose-striate. Spire turrited, the

apex obtuse. Whorls 7, a little convex, separated by a narrowly channelled suture; the last whorl nearly half the length of the shell, slightly tapering at base. Aperture suboval, nearly vertical; columella rather straightened, reflexed, nearly covering the perforation; peristome simple and acute. Alt. 21, diam. 7 mill. (*Sowb.*).

Bogota, U. S. of Colombia (Da Costa coll.).

Bulimulus glandiniformis G. B. Sowerby, P. Z. S., 1892, p. 297, pl. 23, f. 13, 14.

A transparent, fragile shell, with very much the appearance of a *Glandina* (*Sowb.*). It may prove to be a *Drymœus*.

B. krebsianus Pilsbry, n. sp. Pl. 10, figs. 1, 2.

Shell narrowly umbilicated, *long*, ovate-pyramidal, thin, but rather solid; *white*, faintly flesh-tinted toward the apex; somewhat shining. Smoothish, with slight growth-wrinkles, and on some specimens excessively faint, close spiral striæ on the spire. Spire long-conic, the apex obtuse, nepionic whorls very shallowly, minutely zigzag-wrinkled and pitted. Whorls 7½–8, slightly convex, the last rounded.

Aperture ovate, slightly oblique, white inside, contained over 2½ times in length of shell; outer lip acute, unexpanded, regularly arcuate; basal lip narrowly arcuate; columella concave below, straightened above, its edge well reflexed above. Alt. 26, diam. 11, alt. of aperture 9·8 mill.

Carthagena, Colombia (Krebs).

The white color is unusual in this subgenus, but the apical sculpture shows it to belong here. The spire is unusually lengthened.

B. fontainii (d'Orbigny). Pl. 10, figs. 96, 97.

Shell narrowly umbilicated, oblong-conic, rather solid, pellucid, more or less shining, smooth; corneous or greenish-corneous. Spire ovate-conic, rather acute; suture simple. Whorls 6–7, convex, moderately increasing, the last not descending, somewhat compressed at the umbilicus. Columella little oblique, lightly arcuate. Aperture oval, colored like the outside, the base sometimes subangular, about two-fifths the shell's length; peristome simple, unexpanded, acute, the margins converging, joined by a very delicate callus; right margin arcuate, columellar margin dilated above, vaultingly reflexed. Alt. 13½, diam. 6 mill. (*Hidalgo*).

Guayaquil, Ecuador, among plants (Fontaine, Paz and Martinez).

Bulimus fontainii ORB., Voy. Am. Mérid., p. 273.—PFR., Monogr., ii, p. 220.—*B. fontainei* PFR., Monogr., iv, p. 505.—HIDALGO, Journ. de Conchyl., 1875, p. 130, pl. 7, f. 6; Mol. Viaje al Pacif., p. 126.

On some specimens there is a whitish spiral line at the middle of the last whorl. It is allied to *B. unicolor*, but the aperture is rather smaller.

B. UCAYALENSIS (Crosse). Pl. 10, fig. 98.

Shell nearly covered perforate, pyramidal-elongate, thin, pellucid, nearly smooth, uniform corneous-whitish. Spire quite long, the apex somewhat obtuse; sutures well marked. Whorls 5½, slightly convex, the last a little longer than the spire and rounded at base. Aperture nearly oval, whitish-corneous inside; peristome simple and whitish, the margins somewhat separated, columellar margin vaultingly reflexed, covering the greater part of the perforation; basal and outer margins a little reflexed and nearly acute. Alt. 13, diam. 6½ mill.; alt. of aperture 6, width 4¼ mill. (*Crosse*).

Banks of the Ucayali River, Ecuador (Orton).

Bulimus ucayalensis CROSSE, Journ. de Conch., xix, 1871, pp. 229, 317, pl. 13, f. 4.

B. MOLECILLUS (Reeve). Pl. 10, fig. 3.

Shell nearly covered perforate, oblong, somewhat solid, striatulate, little shining, slightly diaphanous, pale corneous. Spire ovate-conic, rather obtuse. Whorls 6, a little convex, the penultimate whorl prominent, last whorl shorter than the spire, somewhat attenuated at base. Columella folded, receding. Aperture oblique, narrowly oval; peristome simple, unexpanded, the right margin very slightly arcuate, columellar margin dilated, flesh-colored, subappressed and reflexed. Alt. 17½, diam. 7½; alt. of aperture 8, width 4 mill. (*Pfr.*).

Tarma, Peru (Jelski).

Bulimus molecillus REEVE, Conch. Icon., pl. 77, f. 565 (Aug., 1849).—PFR., Monogr., iii, p. 436.—LUBOMIRSKI, P. Z. S., 1879, p. 725.

The locality of the Cumingian specimens was unknown, but Lubomirski identifies it from Peru. The distinctly folded columella is hardly a character of the present subgenus, but I do not know where else to place it, having seen no specimens.

Species of N. E. South America, Brazil, Bolivia, Argentina, etc.

B. ORTHODOXUS (Drouet). Pl. 10, figs. 4, 5.

Shell narrowly umbilicated, oval-conic, thin, a little solid, slightly striated, lusterless, warm ashey-grayish or whitish, subtranslucent. Whorls 5, regularly increasing, slightly convex, the last somewhat ventricose. Apex conic, rather acute. Aperture oval, half the total alt. of shell; peristome a trifle thickened, the columellar margin reflexed. Alt. 15, diam. 8 mill.; alt. of aperture 8, width 5 mill. (*Drouet*).

Ilet-la-Mère, French Guiana, under stones on dead leaves (Eyriès).

Bulimus orthodoxus DROUET, Essai sur les Moll. Terr. et Fluv. de la Guyane Française, p. 62, pl. 1, f. 14, 15 (1859).

It is allied to the white, one-colored form of *B. exilis*, but easily distinguished by the smaller size, more ventricose form and the less lengthened aperture. (*Drouet*).

B. EGANUS (Pfeiffer). Pl. 11, figs. 6, 7.

Shell perforate, ovate-conic, thin, under the lens seen to be obsoletely decussated with longitudinal and spiral lines. Surface hardly shining, having a frosted appearance, brown-corneous. Spire conic, the apex obtuse; suture moderate. Whorls 5, moderately convex, the last slightly longer than the spire, obsoletely angulated in the middle, the base a trifle compressed. Aperture oblique, subelliptical, somewhat angular at base; peristome simple, thin, the right margin spreading, columellar margin dilated above, reflexed and subappressed. Alt. 13, diam. 6½ mill.; aperture 7 mill. long. (*Pfr.*).

Ega, Brazil.

Bulimus eganus PFR., Monogr., iii, p. 437; P. Z. S., 1851, p. 258; Conchyl. Cab., p. 85, pl. 30, f. 11, 12.

A small species, with obsolete decussated sculpture, probably allied to *B. buenavistensis.*

B. TENUISSIMUS (d'Orbigny). Pl. 10, figs. 91, 92.

Shell perforate, ovate-conic, very thin, pellucid, scarcely shining, obsoletely and closely decussated by growth striæ and delicate spiral lines; pale corneous, sometimes fulvous. Spire conoid, the apex rather acute, suture simple. Whorls 6, slightly convex, increasing with moderate rapidity, the last whorl convex, not descending in front, somewhat attenuated at base. Columella suboblique, some-

times nearly vertical. Aperture oval, colored like the exterior, one-half the shell's length; peristome simple, unexpanded, acute, the right margin regularly arcuate, columellar margin reflexed above, nearly covering the perforation. Alt. 17, diam. 9 mill. (*Hidalgo*).

Rio Janeiro (type locality; Orbigny, Paz and Martinez); *Bahia* (Paz and Martinez, Moricand, Challenger); *Pernambuco* (Petit).

Helix tenuissima (Fér.) Orb., Mag. de Zool., 1835, p. 11 (name only).—*Bulimus tenuissimus* ("Fér., dans sa collection") Orb., Voy. p. 272.—*B. tenuissimus* ("Fér. ex fide Orb.") Potiez & Michaud, Galerie des Moll. du Mus. de Douai, i, p. 158, pl. 15, f. 19, 20 (1838).—Hidalgo, Viaje al Pacif., p. 119.—Smith, P. Z. S., 1884, p. 280.—*Bulimulus thoreyi* Beck, Index Moll., 1837, p. 67 (name only).—*Bulimus thoreyi* Bk., Pfr., Monogr., iv, p. 500.—Not *B. tenuissimus* Fér., Histoire, pl. 142B, f. 8.

More or less doubtful references: *Bulimus corneus* Pot. & Mich., Galerie, i, p. 137, pl. 14, f. 11, 12, 1838 [from Cayenne; name preoc.].—*Bulimus tenuis* Dkr., MS., *olim*, in Albers, Die Hel., 1850, p. 166, and note 2 on p. 168 [from near Angostura (Gruner); not described].—*Bulimus tenuissimus* Fer., Hist., pl. 142 B, f. 8.—Pfr., Monogr., ii, p. 218; iii, 439; iv, 504; vi, 152.—Tate, Ann. Mag. N. H. (4), iv, 1869, p. 356.—Smith, Ann. Mag. N. H. (6), iii, p. 403.—*Conf.* also, Reeve, f. 288, and Conchyl. Cab., p. 241, pl. 63, f. 25, 26.—Smith, Proc. Malac. Soc., i, p. 316.—Crosse, Journ. de Conchyl., 1890, p. 43 (Journ. of Conch., viii, p. 241).

See pl. 14, figs. 9, 10. Smaller than *B. barbadensis*, with more convex whorls, finer apical sculpture and a gray rather than russet color; the surface has the dull "bloom" of a plum, a little scratched in places showing the glossy surface below. The figures on pl. 10 are from Pot. & Mich., and are not typical. Those on pl. 14 were drawn from "topotypes" collected at Rio Janeiro by Dr. von Ihering. Other localities given for the species are Huanuco, Peru (Fontaine, see Orb.) and Bolivia, given by Orbigny in his preliminary "Synopsis" but omitted by him in the "Voyage," probably because the shells proved distinct on further investigation.

The descriptions of Potiez and Michaud and of d'Orbigny were the first to be published, although there was a *Helix tenuissima* in Férussac's collection prior to d'Orbigny's publication. The date of Férussac's plate 142 B, on which *H. tenuissima* Fér. first appeared is unknown; but as that illustration is quoted neither by d'Orbigny nor by Potiez & Michaud, (who elsewhere cite freely earlier plates

of the Histoire), it is clear that no date earlier than 1838 can be claimed for the Férussacian illustration, unless ample authority can be adduced proving its earlier publication.

B. tenuissimus Fer., Hist., pl. 142 B, f. 8 (see pl. 9, figs. 53, 54) is according to Deshayes, "A thin, transparent, extremely fragile shell of a very pale corneous color, appearing smooth, but when seen under a strong lens the surface is found to be latticed by growth striæ and obsolete, inconspicuous transverse striæ." It has been united by Mr. E. A. Smith (Ann. Mag. N. H., 6th ser., viii, p. 252) with B. *barbadensis* Pfr.; but I am satisfied that they are not identical. At all events, *barbadensis* seems to be distinct from the Brazilian shell first described as *tenuissimus*, and to which the name is here restricted.

The locality "Cayenne," given by Pfeiffer, rests upon authority of doubtful value, depending upon the correctness of his reference of *B. corneus* P. & M. (not Sowb.) to *tenuissimus* as a variety. It is also quoted from Angostura on the authority of specimens called *B. tenuis* by Dunker, which Pfeiffer regards as *tenuissimus*. Trinidad, Barbados, Grenada, and St. Lucia have also been cited as localities for *B. tenuissimus;* but I regard the shells from these localities as specifically different.

B. puellaris (Reeve). Pl. 11, fig. 8.

Shell subperforate, ovate-conic, thin, smoothish, showing very minute oblique striation under the lens, diaphanous, whitish. Spire conic, acute; suture impressed. Whorls 6, but slightly convex, the last somewhat shorter than the spire, rounded at base. Aperture oblique, truncate-oval; peristome simple, unexpanded, the right margin receding at base; columella shortly reflexed above, subappressed. Alt. 22, diam. 10 mill.; aperture 10½ mill. long, 6 wide. (*Pfr.*).

Brazil (Cuming coll.).

Bulimus puellaris Reeve, Conch. Icon., pl. 86, f. 637 (Feb., 1850).—Pfr., Monogr., iii, p. 411.

An elegantly convoluted, semitransparent shell. (*Rve.*).

B. gorrittiensis Pilsbry. Pl. 11, figs. 9, 10.

Shell perforate, ovate-turrited, thin and fragile, corneous-brown or dirty corneous-whitish. Surface slightly shining, sculptured with irregular and rather coarse wrinkles of growth. Spire elevated, rather slender, the lateral outlines straight; apex quite obtuse, the

nepionic whorls shallowly, rather irregularly zigzag wrinkled in the young, this sculpture lost with age. Whorls 6½, convex, with well impressed sutures.

Aperture ovate, rather wide, brownish inside, varying from slightly to decidedly under half the length of the shell; outer lip regularly arcuate, acute, unexpanded and fragile, columella slightly concave, the columellar margin narrowly reflexed above.

Alt. 20, diam. 10⅓ mill.; alt. of aperture 9 mill.

Alt. 17½, diam. 8 mill.; alt. of aperture 7 mill.

Alt. 17, diam. 8⅔ mill.; alt. of aperture 8 mill.

Gorritti Island, Maldonado Bay, Uruguay (Dr. Wm. H. Rush, U. S. N.).

B. gorritiensis PILS., Nautilus, x, p. 78 (name only); Proc. Acad. N. S. Phila., 1897, p. 18 (Feb. 23).

A smaller, thinner, more turrited shell than *B. sporadicus* or its varieties, the whorls more convex, apex blunter, the first whorl being planorboid. The whorls are more convex and more wrinkled than in *thoreyi* or *tenuissimus*.

B. SPORADICUS (Orbigny). Pl. 11, figs. 12, 13, 14, 15, 16, 17, 18.

Shell perforate, oblong-subfusiform, thin, striatulate; whitish or pale corneous, typically variegated with narrow corneous or brown streaks. Spire elongated, conic, the apex acute. Whorls 7–8, slightly convex, the last about three-sevenths the total alt., attenuated at base. Columella somewhat straightened, a little receding. Aperture oval-oblong; peristome simple, unexpanded, the columellar margin dilated above and reflexed half over the perforation.

Alt. 32, diam. 12½; aperture 15 mill. long, 7 wide.

Prov. Corrientes, Entre-Rios, Buenos Ayres, and south to the Rio Negro, Argentina; Montevideo, Uruguay.

Helix sporadica ORB., Mag. de Zool., 1835, p. 12.—*Bulimus sporadicus* ORB., Voy. dans l'Amér. Mérid., p. 271, pl. 32, f. 12–15.—PFR., Monogr., ii, p. 201; vi, p. 128.—HEYNEMANN, Malak. Bl. 1868, p. 108, pl. 4, f. 6 (jaw and teeth).—HIDALGO, Viaje al Pacif., p. 120. —*Bulimulus* (*Thaumastus*) *sporadicus* STROBEL, Mater. Malac. Argent., p. 24 (with var. *bonariensis*).—DOERING, Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 73 (with varr. *montevidensis* and *subtropicalis*).—PARAVICINI, Bol. Mus. Zool. ed Anat. Comp. Univ. Torino, ix, no. 181, p. 6 (1894).—*Bulinus sporadicus* SOWB., Conch. Illustr., f. 73–75.—*Bulimus montevidensis* PFR., P. Z. S., 1846, p.

33; Monogr., ii, p. 202.—REEVE, C. Icon., f. 114. See also, HIDALGO, Journ. de Conch., 1875, p. 128: 1870, p. 60.

Typical SPORADICUS Orb., as restricted by Pfeiffer, is brownish or whitish, with brown longitudinal streaks (figs. 12–14). The var. *subtropicalis* of Doering is a synonym.

Chiquitos region, Bolivia.

Var. BONARIENSIS Strobel.

Shell more ventricose, thinner, paler, of a unicolored ashy-yellow. Alt. 25, diam. 14 mill.

Buenos Ayres, Argentina.

Var. MONTEVIDENSIS Pfeiffer (pl. 11, fig. 19), is opaque white with close, narrow longitudinal corneous streaks; often showing an indication of peripheral angulation, produced by color rather than by form.

Alt. 31, diam. 15; alt. of aperture 15 mill.

Alt. 33, diam. 14½; alt. of aperture 14½ mill.

Montevideo, Uruguay.

Pfeiffer was the first to restrict Orbigny's species, so that the above arrangement of the varieties should replace that proposed by Doering, as well as the transposition advocated by Hidalgo. The apex in this species is not smooth, as in *Lissoacme*, but minutely pitted, pits closely arranged in oblique series, the sculpture scarcely visible on many adult shells from the effects of wear, but constantly present on young and unworn adult specimens. The jaw has about 12 vertical riblets; teeth in nearly straight transverse rows.

B. CORUMBAENSIS Pilsbry. Pl. 14, figs. 3, 4, 5, 6, 7, 8.

Shell umbilicate, ovate, with rather lengthened spire; rather thin but solid and strong when adult; opaque-white, with numerous dark brown or corneous longitudinal streaks, the last whorl often becoming abruptly darker below the periphery; surface shining, with irregular growth-wrinkles, no spiral striæ or with only the faintest traces of them. Spire conic, the lateral outlines nearly straight; apex small, obtuse, 1½ earlier whorls reddish-corneous, densely and distinctly wrinkled in finely zig-zag pattern, sharply defined from the after-growth. Whorls fully 7, but slightly convex, slowly widening, separated by impressed sutures.

Aperture ovate, slightly oblique, white or slightly streaked within, somewhat less than half the length of the shell; edge of outer lip

a trifle expanded, with more or less general expansion basally; columella oblique, nearly straight, the columellar lip very broadly revolute around the capacious umbilical cavity, and faintly flesh-tinted.

Alt. 24½, diam. 12; alt. of aperture 11⅓ mill.

Alt. 23¾, diam. 10½; alt. of aperture 11 mill.

Corumbá, Prov. Matto Grosso, Brazil (H. H. Smith).

Bulimus amœnus Bonnet, Rev. et Mag. de Zool., 1864, p. 70, pl. 6, f. 2. Not *Bulimus amœnus* Pfr.—*Bulimulus corumbaensis* Pilsbry, Proc. Acad. Nat. Sci. Phila., 1897, p. 19 (Feb. 23).

The locality given by Bonnet for this species is incorrect, like most of those recorded for the species described in his paper. It occurs at Corumbá, where Mr. Herbert H. Smith found it common on walls, etc. *B. corumbaënsis* is closely allied to the typical form of *B. sporadicus* Orb., but it is a less elongated shell, solid, with distinctly expanded peristome and *very widely dilated columellar lip*, the umbilicus much larger than in *sporadicus*. The striped color-pattern is a conspicuous but variable character. Bonnet's figures are copied on pl. 14, figs. 7, 8.

B. vesicalis (Pfeiffer). Pl. 12, figs. 42, 42.

Shell subperforate, ventricose ovate, tapering toward each end, thin, pellucid, striatulate; pale corneous above. Spire somewhat concavely conic, the apex rather acute, whorls 6½, a little convex, the last whitish, as long as the spire, more swollen, columella slightly receding. Aperture little oblique, oblong-oval, pearly within; peristome simple, unexpanded, acute, the columellar margin vitreous, vaulted, reflexed. Alt. 25, diam. 13 mill.; aperture 14 mill. long, 7 wide. (*Pfr.*).

Brazil (Coll. Gruner).

Bulimus vesicalis Pfr., Zeitschr. f. Mal., March, 1853, p. 58; Conchyl. Cab. p. 261, pl. 70, f. 23, 24; Monographia iii, p. 654; viii, p. 146. Not *B. vesicalis* Gld., Oct. 1853.

Var. *uruguayanus* Pilsbry, n. var. Pl. 12, figs. 38, 39.

Shell perforate, ovate or oblong with rather short, conic spire; thin but moderately solid, corneous-brown or dirty white, adults being usually denuded of the thin cuticle. Surface shining in the young, but nearly lusterless when adult, having irregular growth-wrinkles often quite prominent on the back of last whorl. Spire

short-conic, its outlines a trifle concave above; apex obtuse, the nepionic whorls showing shallow, short ripples in the young, mainly lost by wear in the adult. Whorls 5¾–6½, moderately convex, the last two more convex, last whorl either quite obese or somewhat compressed; sutures well impressed.

Aperture subvertical, white within, ovate, acutely angular above, about one-half as long as shell; outer lip regularly arcuate, acute and unexpanded; columella nearly straight, the margin reflexed above.

Alt. 22½, diam. 14 mill.; alt. of aperture 12 mill.

Alt. 24, diam. 13 mill.; alt. of aperture 12 mill.

Montevideo, Uruguay, in the plain back of the "Cerro," on thistles (Dr. Wm. H. Rush, U. S. N.).

This species resembles *B. apodemetes* d'Orb. in contour, but the apex is decidedly larger, the outlines of the spire contracted above, columella straighter, and finally the nepionic whorls, which appear quite smooth even in young *apodemetes,* are seen to be distinctly though shallowly sculptured when the apex is unworn. It is more closely allied to *B. sporadicus* and *montevidensis,* but in the latter species the spire is much longer and more attenuated, the sutures shallower, and the surface without streaked coloration. I have not seen Strobel's var. *bonariensis,* but from his calling it thinner than *sporadicus* I conclude that it must differ from the present form, which is fully as solid as the thickest *sporadicus* or *montevidensis* which I have seen.

B. RUSHII Pilsbry. Pl. 12, fig. 47.

Shell *umbilicate, globose-ovate,* rather thin but solid, light-yellowish. Surface with inconspicuous growth wrinkles and *extremely fine, close incised spiral striæ,* visible only above the periphery. *Spire very short,* conic, the apex obtuse. Whorls slightly over 6, moderately convex, the suture shallow but well marked. Aperture slightly oblique, ovate, a trifle over half the total length of shell; peristome simple, unexpanded. The columellar margin *broadly dilated above.* Alt. 19¼, diam. 14 mill.; alt. of aperture 10 mill.

Maldonado, Uruguay (Dr. W. H. Rush).

Bulimulus Rushii PILS., Nautilus, x, Nov. 1, 1896, p. 78, (name only); Proc. Acad. N. S. Phila., 1897, p. 18 (Feb. 23).

Apparently allied to *B. sporadicus* and *B. vesicalis*, especially to the stouter variety of the latter species; but conspicuously different in the very short spire, globose form and widely open, deeply penetrating umbilicus. By an inadvertent exchange of labels, a wrong locality was given in the catalogue of Dr. Rush's shell in the Nautilus.

B. MENDOZANUS Strobel. Pl. 11, figs. 22, 23.

Shell covered-perforate, oblong, thin, the spire elongate, apex obtuse; suture impressed. Whorls 4½–5, somewhat convex, rapidly increasing, the first very delicately longitudinally striated, shining, roseate-buff, the rest longitudinally subrugose, somewhat shining, buff with longitudinal corneous rays, the last not descending, slightly exceeding half the shell's length.

Aperture oblique, oval, peristome simple, acute, the margins joined by a very thin parietal callus; outer margin unexpanded, the columellar thin, a little expanded above, half closing the perforation; throat whitish-rose. Alt. 20–24, diam. 10–12; aperture, length 11–13, width 7–8 mill. (*S.*).

Villa Vicencio, Sierra de Mendoza, Argentina (Strobel).

Bulimulus (Eudioptus) mendozanus STROB., Mater. Malac. Argent., p. 23, pl. 1, f. 4 (1874).—DOERING, Bol. Acad. Nac. Cien., iii, p. 70. —*B.* (*Mormus*) *mendozanus* MARTENS, Jahrb. D. M. Ges., ii, 1875, p. 270.

It differs from *B. pseudosuccinea* Moric. in the perforation of the shell, more convex and less numerous whorls, and more obtuse spire (*Strobel*). Doering believes it allied to *B. monticola* and *B. tortoranus;* while von Martens refers the species to s. g. *Mormus.*

B. FOURMIERSI (d'Orbigny). Pl. 11, figs. 26, 27, 28.

Shell short, rather ventricose, subumbilicate; thin, diaphanous and smooth; uniform gray-brown. Spire conic, short, the apex obtuse; whorls 5, convex, swollen, separated by deep sutures. Aperture oval, the peristome thin and sharp; columella very narrow. Alt. 11, diam. 7 mill. (*Orb.*).

Prov. Corrientes, Argentina, near Rio de Santa Lucia, at a place called *Pasto reito,* in a clump of trees in the plains (Orb.).

Bulimus fourmiersi D'ORB., Voy., p. 273, pl. 30, f. 12–14.—PFR., Monogr., ii, p. 196.—*Thaumastus fourmiersi* DOERING, Bol. Acad. Nac. Cien. Rep. Arg., iii, p. 73.

Shorter than *B. tenuissimus,* with deeper sutures.

B. SIMPLEX (Hupé). Pl. 11, figs. 31, 32.

Shell thin, fragile, corneous, ovate-conic with acuminate spire, acute at apex; whorls 6–7, narrow and convex, the last more swollen, about half the total length. Aperture oval; peristome thin, sharp, dilated toward the base; columellar margin dilated above, partly covering the small umbilical fissure. Alt. 15, diam. 8 mill. (*Hupé*).

Peru, (Castelnau).

Bulimus simplex HUPE (Castelnau's) Anim. nouv. ou rares * * Amér. du Sud Moll., p. 53, pl. 9, f. 6 (1857).—PFR., Malak. Bl., 1858, p. 166.

Allied to *B. tenuissimus*, but more swollen, and the spire is more acuminate (*Hupé*). Pfeiffer considers this a synonym of *B. fourmiersi*, but that seems a shorter shell. The locality given above is doubtful. The name is preoccupied by Jonas in *Bulimus*.

B. HELOICUS (d'Orbigny). Vol. X, p. 193, pl. 51, figs. 12, 13.

Probably belongs to this group rather than to *Lissoacme*.

B. NIVALIS (d'Orbigny). Pl. 11, figs. 35, 36.

Shell subimperforate, conic-ovate, thin, smooth; greenish-corneous, here and there streaked with chestnut; spire conic, obtuse. Whorls 5, a little convex, the last longer than the spire, rounded at base; columella very lightly arcuate. Aperture somewhat oblique, acuminate-oval; peristome simple, unexpanded, the columellar margin thin, reflexed and adnate. Alt. 16, diam. 8⅔; aperture 9 mill. long, 5 wide. (*Pfr.*).

Mountains around Potosi, Bolivia, 5000 meters alt., under stones, etc. (Orb.).

Helix nivalis ORB., Mag. de Zool., 1835, p. 12.—*Bulimus nivalis* ORB., Voy., p. 287, pl. 32, f. 8, 9.—PFR., Monogr., ii, p. 170; iii, 406; iv, 466; vi, 107.

In form like *B. oblongus* on a very small scale, but thin and sharp-lipped. Orbigny gives alt. 14, diam. 9 mill., as the size. The subgeneric position is doubtful.

B. PLICATULUS (Pfeiffer). *Unfigured.*

Shell umbilicated, ovate-conic, rather thin, *sculptured with low, somewhat varix-like folds;* hardly shining, pale gray, irregularly painted with *very narrow white and brown streaks.* Spire conic, acute. Whorls 7, slightly convex, the last a little shorter than the spire, base somewhat compressed around the moderate sized, rounded

umbilicus. Columella rather straightened. Aperture slightly oblique, elliptical-oblong, the peristome simple, unexpanded, columellar margin dilated from the base, vaultingly reflexed. Alt. 23, diam. 11⅓ mill.; aperture 11 mill. long, 6 wide. (*Pfr.*).

Bolivia (Cuming coll.).

Bulimus plicatulus PFR., P. Z. S., 1856, p. 390; Monogr., iv, p. 488.

B. CASTELNAUI (Pfeiffer). *Unfigured.*

Shell subperforate, fusiform-turrited, rather thin, striatulate (somewhat decussated under a lens); shining, gray-whitish, with sparsely scattered pellucid dots; spire elongate-conic, the apex acute, corneous. Whorls 7½, a little convex, the last about two-fifths the length of shell, attenuated at base. Columella rather straightened. Aperture oblique, oblong, flesh-colored inside; peristome simple, unexpanded, the columellar margin dilated above, vaultingly reflexed. Alt. 20, diam. 8½ mill.; alt. of aperture 8⅔, width 8 mill. (*Pfr.*).

Rio Pampas, Bolivia (Castelnau, in Mus. Cuming).

Bulimus castelnaui PFR., P. Z. S., 1856, p. 332; Monogr., iv, p. 473.

A slender shell with scattered pellucid dots. Its generic position is not known.

Locality unknown.

B. TRANSPARENS (Reeve). Pl. 11, fig. 11.

Shell subperforate, oblong-conic, thin, rugose-striate, pellucid, dull corneous. Spire conic, somewhat obtuse. Whorls 6, a little convex, the last a little shorter than the spire, somewhat attenuated at base. Columella arcuate. Aperture oblique, oval; peristome simple, the right margin slightly arcuate, columellar margin shortly reflexed above, subappressed. Alt. 19, diam. 8 mill.; alt. of aperture 9½, width 5 mill. (*Pfr.*).

Habitat unknown (Cuming coll.).

Bulimus transparens RVE., Conch. Icon., pl. 77, f. 566 (August, 1849).—PFR., Monogr., iii, p. 436.

Of as light and delicate a structure as any *Lymnea.* (*Rve.*).

B. INUTILIS (Reeve). Pl. 11, fig. 37.

Shell perforate, oblong-conic, rather solid, irregularly plicatulate, little shining, corneous. Spire conic, somewhat obtuse. Whorls 6, a little convex, the last somewhat shorter than the spire, compressed at base. Columella lightly arcuate. Aperture little oblique, oblong,

subangulate at base; peristome simple, unexpanded, the columellar margin dilated above and vaultingly reflexed. Alt. 17, diam. 8 mill.; aperture 8 mill. long, 4 wide. (*Pfr.*).

Habitat unknown (Cuming coll.).

Bulimus inutilis REEVE, Conch. Icon., pl. 86, f. 639 (Feb., 1850). —PFR., Monogr., iii, p. 438.

Differs from *B. nubeculatus* by the less convex whorls, the last one longer, narrow umbilicus, etc. (*Pfr.*). The type should be compared with the numerous similar *Leptomerus* species.

B. HAPLOCHROUS (Pfeiffer). *Unfigured.*

Shell perforate, ovate-fusiform, thin, rather smooth, not shining, diaphanous, corneous whitish; spire long, convex-turrited, rather acute. Whorls 7, but slightly convex, the last a little shorter than the spire, attenuated at the base. Columella lightly arcuate. Aperture oblique, subelliptical, subangulated at base; peristome simple, unexpanded, the right margin regularly arcuate, columellar margin dilated above, vaultingly reflexed. Alt. 30, diam. 12 mill.; aperture 14 mill. long, 7 wide in the middle. (*Pfr.*).

Habitat unknown (Cuming coll.).

Bulimus haplochrous PFR., P. Z. S., 1854, p. 125; Monogr., iv, p. 502.

May be allied to *B. krebsianus.*

Section RHINUS Albers, 1860.

Rhinus ALB., Die Heliceen (edit. von Martens), p. 223. Type *B. heterotrichus* Moric.

Bulimuli with the nepionic whorls finely and densely rugose from the interruption of waved striæ, or zigzag-striate; the cuticle elsewhere hairy or bristly in spiral lines. Form globose-ovate to oblong; perforate; lip expanded or narrowly reflexed. Type *B. heterotrichus.*

Distribution, eastern and north-eastern South America, from southern Brazil to Venezuela.

These forms are closely allied to typical *Bulimulus,* but differ in the bristly or velvet-like cuticle, which as usual functions as a holder of soil for the purpose of protection. It is a further development of the cuticular spirals seen in many Bulimuli of the typical group.

Key to species of Rhinus.

I. Cuticular processes of two kinds: longer bristles in spaced spiral rows, and numerous spirals between them bearing smaller hairs.

a. Nepionic whorls with the wrinkles much waved and interrupted (pl. 13, fig. 25).

b. Ovate-conic, rather solid, *heterotrichus*, p. 75.

b'. Ovate-globose, rather thin, *longiseta*, p. 77.
velutinohispidus, p. 76.

a'. Nepionic whorls very densely striolate longitudinally (pl. 13, fig. 21); spire elevated, conic.

b. Many spirals between the rows of bristles, which are about a millimeter apart, *scobinatus*, p. 77.

b'. Fewer spirals between the rows of bristles, which are much nearer together, *ciliatus*, p. 78.

II. Cuticle with a uniform close pile of subequal curved hairs; nepionic whorls densely zigzag striate.

a. Columella with a projecting fold above; alt. 13–16 mill., *pubescens*, p. 81.

a'. Columella not folded; alt. 22–25 mill., *constrictus*, p. 80; *sarcochilus*, p. 80.

B. koseritzi (p. 79) is not included in the above table.

B. HETEROTRICHUS (Moricand). Pl. 13, fig. 1; pl. 15, fig. 18.

Shell narrowly umbilicate, ovate-conic, solid and strong or rather thin; chestnut-brown or light yellowish-brown, paler and yellowish above, and with a narrow light girdle at the periphery, sometimes having a spiral chestnut band within the umbilicus. Surface densely spiralled with rows of short, curved and rather stiff hairlets, and with widely spaced rows of separated stiff and much longer bristles, usually in great part lost in adult shells, but leaving more or less obvious scars (pl. 15, fig. 18). Spire straightly conic, the apex obtuse, nepionic whorls densely and very finely waved and rugose. Whorls about 6½, but slightly convex, the last large and globose, descending toward the aperture, a trifle contracted behind the peristome.

Aperture oblique, round-ovate, purplish within; peristome expanded and narrowly reflexed, white; columellar margin dilated

above, partly covering the umbilicus; columella concave; parietal callus thick or thin.

Alt. 41, diam. 28, alt. of aperture 20 mill.

Alt. 36, diam. 26, alt. of aperture 18·5 mill.

Alt. 36, diam. 23, alt. of aperture 16 mill.

Alt. 33·5, diam. 21 mill.

Brazil: Bahia (Blanchet, von Ihering); *Corcobado, at Rio Janeiro* (Paz.).

Helix (*Cochlogena*) *heterotricha* MORICAND, Mém. de Phys. et Soc. d'Hist. Nat. Genève, vii, pt. 2, p. 430, pl. 2, f. 5, 6 (1836).—*Bulimus heterotrichus* DESH. in Lam., Anim. s. Vert., viii, p. 241; and in Fér., Hist., ii, p. 16, pl. 157, f. 1, 2.—BECK, Index, p. 51.—REEVE, Conch. Icon., pl. 32, f. 199.—PFR., Monogr., ii, p. 116; vi, p. 28.—HIDALGO, Journ. de Conchyl., 1870, p. 59.

Doubtful synonyms: *Helix tumida* GMEL., Syst. Nat. (13), p. 3668, based on Gualtieri, pl. 5, f. Q.—*Helix scobinata* FER.? according to Pfeiffer.

A larger and stronger species than *B. velutinohispidus*, with more whorls, a longer and more conic spire, and less inflated body-whorl. According to Moricand the animal is entirely black. His measurements, alt. 55, diam. 32 mill., are greater than in any of the shells before me.

Var. *subtenuis* n. v. Pl. 13, figs. 2, 25; pl. 15, f. 19.

This is a smaller, thinner form, with shorter spire of scarcely 6 whorls, lighter corneous-brownish color, and proportionally larger aperture. The peristome is less developed.

Alt. 28, diam. 20, alt. of aperture 15 mill.

Alt. 29, diam. 21, alt. of aperture 15·5 mill.

B. VELUTINOHISPIDUS (Moricand). Pl. 13, fig. 3; pl. 15, fig. 20.

Shell perforate, *globose*, with short, conic spire, *thin*, light brownish corneous or olivaceous, generally more or less covered with dirt, except on the front of the body-whorl, the surface roughened by dense spiral lines of short hairs and more spaced series of stiff bristles, often lost in the adult shell (pl. 15, fig. 20). Spire short, conic, the apex obtuse, nepionic whorls very shallowly and finely waved in irregular, indistinct pattern. Whorls 5½, quite convex, the sutures well impressed; last whorl much inflated, descending gradually in front.

Aperture rounded, decidedly oblique, of a fleshy tint inside; peristome white, very narrowly subreflexed, the columellar margin broadly, triangularly dilated above, columella concave.

Alt. 20, diam. 17, alt. of aperture 11 mill.

Alt. 27, diam. 22 mill.

Brazil, Bahia, on the ground under dead leaves, in damp places (Blanchet).

Helix velutino-hispida Moric., Mém. Soc. Phys. Hist. Nat. de Genève, vii, p. 429, pl. 2, f. 4 (1836).—*Bulimus velutino-hispidus* Desh. in Lam., Anim. s. Vert., viii, p. 262.—Pot. & Mich., Galerie, i, p. 158, pl. 15, f. 21, 22.—Pfr., Monogr., ii, p. 100; vi, p. 49.—*Bulimus hirtus* Beck, Index, p. 51 (1837).

There are more rows of bristles than in *B. heterotrichus,* and the shell is more globose with shorter spire and fewer whorls; it is also less solid. In *B. scobinatus* the spire is much longer and the aperture proportionally smaller. The animal is dark with a tint of rose. The measurements last given above are from Moricand.

B. longiseta (Moricand). Pl. 13, figs. 22, 23.

Shell ventricose-conic, perforate, pellucid, thin, dull yellowish. Spire conic, obtuse; whorls 4, rotund, with well marked sutures, the last whorl inflated, marked with an inconspicuous paler zone; covered with sparse long bristles, readily detached, and nearly a millimeter in length, a little curved in different directions; aperture subrotund, the lips thin. Umbilicus narrow but deep. Alt. and diam. 7 mill.

Province of Bahia, Brazil (Blanchet).

Helix (*Bulimus*) *longiseta* Moric., Mém. Soc. Phys. et Hist. Nat. Genève, xi, p. 156, pl. 5, f. 18–20 (1846).—Pfr., Monogr., ii, p. 196.

Pfeiffer, who probably had not seen the shell, supposes this may be the young of *B. velutinohispidus.* It is known to me by Moricand's description and figures only.

B. scobinatus (Wood). Pl. 13, figs. 4, 7, 21; pl. 15, fig. 25.

Shell narrowly umbilicate, ovate-conic, rather thin; olive yellow or light brown-olive, somewhat shining. Surface with close, fine spiral lines of short cuticular hairs or asperities, and spaced series of much larger stiff short bristles. Spire long, conic, the apex obtuse, 2 nepionic whorls sculptured with excessively close, minute,

somewhat undulating vertical striæ (fig. 21) with indistinct, fine spiral lines above the suture. Whorls 5¾ to 6½, convex, the last globose, usually a trifle angulated peripherally at its origin, slightly deflexed in front.

Aperture rounded, oblique, somewhat flesh-tinted within; peristome paler, narrowly expanded; columellar margin broadly dilated above.

Alt. 23·7, diam. 15, alt. of aperture 10·5 mill.; whorls 6½.

Alt. 17, diam. 12, alt. of aperture 8·5 mill.; whorls 5¾.

Brazil.

Helix scobinata Mawe, Wood, Index Testac. Suppl., pl. 8, f. 77. —Pfr., Monogr., ii, p. 100; iii, p. 338; vi, p. 49; Conchyl. Cab., p. 253, pl. 68, f. 12, 13.

The high conic spire and especially the clear-cut but very minute striolation of the apex are leading features of this species. It varies a good deal in size and number of whorls.

Var. Pl. 15, figs. 21, 22.

Fragile, with the sculpture and slight anterior peripheral angulation of *scobinatus;* but decidedly more globose with shorter spire; whorls 5¾. Alt. 19½, diam. 15 mill.

B. ciliatus (Gould). Pl. 13, figs. 17, 18; pl. 15, fig. 24.

Shell thin and fragile, ovate-conic, acute at summit, covered with minute, crowded longitudinal and revolving striæ. On the revolving striæ are seated series of dark, stiff, tapering, slightly recurved hairs of unequal length; there are about eight series of the long ones on the penult whorl, and about twenty on the last whorl, between two of which are either two or three series of shorter and finer ones, the whole resembling coarse velvet. Whorls six, convex; [nepionic whorls densely and minutely vertically striolate, the striæ clear-cut, somewhat beaded by the crossing of equally fine incised spiral lines]; the last one large, ventricose, and subcarinate. Suture profound; aperture subovate, slightly angular at base, lip simple, acute; columella straight, white, reflected over a small, deep perforation. Length of axis five-sixths of an inch, breadth six-tenths of an inch. (*Gld.*).

Alt. 19, diam. 15, alt. of aperture 10 mill. (specimen).

Brazil, Province Rio de Janeiro, Organ Mountains, on bushes near the water (Dr. Pickering), *and San Domingo, a suburb of Rio Janeiro,* on the trunks of trees (A. D. Brown).

Bulimus ciliatus GLD., Proc. Bost. Soc. N. H., ii, p. 191 (Dec., 1846); Expedition Shells, p. 32; U. S. Expl. Exped. Moll., p. 75, pl. 6, f. 80.—PFR., Monogr., ii, p. 174.—A. D. BROWN, Ann. Lyc. Nat. Hist. N. Y., ix, p. 158.

Animal very dark slate-color, almost black, oculiferous tentacles long and slender, and, like the neck, finely granulate; body obliquely wrinkled; foot and mouth paler, respiratory orifice very large.

This shell, with its thick green epidermis, looks like a *Paludina*, especially like fresh specimens of *P. decisa* Say, which have similar series of ciliæ. Another Brazilian species, *B. velutinohispidus* Moric., has a similar velvety vesture, but it is a more globular, heliciform species. (*Gld.*).

The apical whorls are striolate as in *B. scobinatus*, but that is a decidedly more slender species. *B. velutinohispidus* is more globose, with different apical sculpture. As in *B. scobinatus*, the body-whorl is indistinctly keeled peripherally at its origin, and the lip is very narrowly expanded and subreflexed. Gould's figures, which I have copied on pl. 13, show the hairs too long.

B. KOSERITZI (Clessin).

Shell rounded-ovate, rather strong, openly umbilicated. Spire short, conic; whorls 7, slowing increasing, separated by sutures of little depth, the last whorl fully half the entire length of the shell. Surface of the whorls slightly striated, with (in the single decorticated specimen before me) little shallow, irregularly placed depressions, apparently indicating that fresh shells are hairy. Aperture narrow, ovate, strongly attenuated above; the peristome somewhat thickened and expanded; parietal callus thin. Columella nearly straight. Alt. 20, diam. 14 mill. (*Clessin*).

Brazil (von Ihering).

Bulimus (Rhinus) koseritzi CLESS., Malak. Blätter (n. F.), x, p. 168 (1888?).

Clessin omits the locality, but it is probably either from Bahia or southern Brazil near Taguara. The "unregelmässig angeordnete Vertiefungen" are exceptional in *Rhinus*, the hairs or hair-scars being arranged in spiral lines as a rule. The position of the species is, therefore, uncertain.

B. SARCOCHILUS (Pfeiffer).

Shell deeply rimate, ovate-pyramidal, thin, under the lens seen to be decussated and roughened by short bristles, tawny. Spire conic, somewhat acute; whorls 7 to 8, a trifle convex, the last two-fifths the total length, obsoletely angulated below the middle.

Aperture oblique, truncated oblong; peristome brownish flesh-colored, narrowly expanded, the right margin arcuate above, then becoming rather straightened; columellar margin dilated, spreading above. Columella a little receding. Alt. 21 to 25, diam. 10 to 11½ mill.; aperture 9½ to 10 mill. long, 5⅔ to 6⅓ wide. (*Pfr.*).

Northern Brazil (Miers, in Cuming coll.).

Bulimus sarcochilus PFR. in Malak. Bl., iv, 1857, p. 157; Monographia, iv, p. 412.

An unfigured species, probably allied to *B. constrictus*, but of darker color, the whorls less convex, the last one obsoletely angulated below the middle.

B. CONSTRICTUS (Pfeiffer). Pl. 13, figs. 10, 11, 12, 13, 14.

Shell narrowly umbilicate, oblong, rather thin but moderately solid, pale buff. Sculpture of growth-striæ and close, fine spiral lines of short hairs, as in *B. pubescens*. Spire convex-conic, the apex very obtuse, nepionic whorls densely and regularly wave-wrinkled as in *pubescens*. Whorls 6½ to 7, convex, especially below the deep sutures.

Aperture ovate, slightly oblique, flesh-colored inside; peristome narrowly expanded, subreflexed, whitish.

Alt. 22, diam. 11; alt. of aperture 9⅓ mill.

Alt. 19, diam. 10; alt. of aperture 8 mill.

Venezuela, *Angostura* (Stentz, Gruner); *La Guayra* (Krebs, Otto); *Caraccas* (Moritz, Gollmer & Ernst).

Bulimus constrictus PFR., Symbolæ ad Hist. Hel., i, p. 43 (1841); Conchyl. Cab., p. 149, pl. 39, f. 8, 9; Monogr., ii, p. 110; viii, 70.—REEVE, Conch. Icon., pl. 59, f. 402. Not *B. constrictus* RVE. Conch. Icon., pl. 47, f. 307, = *B. redditus* Rve., errata to C. Icon., = *B. crepundia* Orb.—*Bulimulus constrictus* MARTENS, Binnenmoll. Venezuela's, in Festschrift zur Feier des 100-Jährigen Bestehens der Ges. Naturforsch. Freunde zu Berlin, p. 178, pl. 2, f. 17*a* (jaw), 17*b*, *c*, *d* (radula).—*Bulimus constrictus* var. *tateanus* GUPPY, P. Z. S., 1875, p. 322.—*Bulimus angosturensis* GRUNER, Wiegm. Archiv

für Naturg., 1841, i, p. 278, pl. 11, f. 3 (immature).—*B. constrictus* Pfr.–Cless., Nomencl. Hel. Viv., p. 228.

Distinguished from the closely allied *B. pubescens* by its larger size, somewhat stouter form and lack of the strong columellar fold of that species. It is also geographically separated from *pubescens*. Guppy has described a slightly smaller form as var. *tateanus*. Alt. 17, diam. 8, alt. of aperture 6 mill. The locality given is "Venezuelan Guiana." Typical *constrictus*, however, ranges at least as far west as La Guayra, and the alleged varietal characters of *tateanus* quite disappear when a large series of well-preserved specimens is examined. The length varies from 17 to 23 mill. *B. angosturensis* Gruner (pl. 13, figs. 13, 14) was based upon immature shells.

The jaw has 11 wide folds, and like the radula, is of the typical *Bulimulus* type.

The localities *New Granada* and *Upper Maranhon* have been reported on the evidence of Cumingian labels. They remain doubtful.

B. PUBESCENS (Moricand). Pl. 13, figs. 15, 16, 19; pl. 15, fig. 23.

Shell perforate, oblong, the length generally exceeding twice the diameter, rather thin but moderately solid, light buff or corneous-buff; surface with close, irregular growth-striæ and close fine spiral lines of minute hairs, giving a velvet-like surface to which earth adheres. Spire long, convex-conic, the apex very obtuse, nepionic whorls densely sculptured with conspicuously sinuous, often interrupted striæ (fig. 19). Whorls 6½, quite convex, separated by deep sutures.

Aperture small, slightly oblique, whitish inside; peristome rather narrowly reflexed, white; columella concave below, with a rather strong fold above.

Alt. 16, diam. 7½; alt. of aperture 6⅓ mill.

Alt. 13⅔, diam. 6½; alt. of aperture 5½ mill.

Bahia, Brazil (Blanchet).

Helix (*Bulimus*) *pubescens* Moric., Mém. Soc. Phys. et Hist. Nat. Genève, xi, p. 157, pl. 5, f. 21–23 (1846).—*Bulimus pubescens* Pfr. in Conchyl. Cab., p. 150, pl. 39, f. 10, 11; Monographia, ii, p. 111; vi, p. 57.—Reeve, Conch. Icon., pl. 63, f. 437.

Smaller than *B. constrictus* Pfr., and with a stronger columellar fold.

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Section Hyperaulax Pilsbry, 1897.

Hyperaulax Pils., Proc. Acad. Nat. Sci. Phila., 1897, p. 10 (Feb. 23).

Bulimuli with wave-wrinkled apical sculpture, and an expanded or reflexed peristome, the aperture with a longitudinal groove or channel at the posterior angle and a callous nodule adjacent to it on the parietal wall. Type *B. ridleyi.*

Distribution: Fernando Noronha Island; Miocene of Florida (Silex-beds).

This group, which is well distinguished by the channel at the posterior angle of the aperture, is apparently extinct, with the exception of a single surviving species. The Floridian Miocene species, *B. floridanus* Conrad, *B. heilprinianus, americanus* and *stearnsii* Dall, are practically identical with *B. ridleyi* in their main characters, differing only in unimportant details of proportion, size and striation. *B. americanus* is excessively like *B. ridleyi.*

There can be no reasonable doubt that *Bulimulus ridleyi* is a living representative of the Miocene group, preserved practically unchanged on the remote island of Fernando Noronha, while the group has been wholly crowded out of existence in the continental faunas.

B. ridleyi (E. A. Smith). Pl. 14, figs. 11, 12, 13.

Shell umbilicated, ovate, conic above, moderately solid, brown with a buff line at the periphery, very delicately sculptured with lines of growth, and sometimes low wrinkles and fine impressed spiral striæ. Spire conic, the apex obtuse, nepionic whorls sculptured with superficial vermiculate wrinkles. Whorls 5½, slightly convex, the last a little descending and then slightly ascending in front, distinctly constricted behind the peristome; base perforated by a deep and conspicuous though not wide umbilicus.

" Aperture ovate, fleshy-brown inside, and showing a pale median line, half the length of the shell; " *peristome flatly reflexed throughout,* the outer lip subangularly arcuate above, terminations joined by a thin or thick parietal callus, which is *thickened and somewhat tubercular above, separated by a vertical groove or channel from a similar callous lobe on the outer lip* near its insertion.

Alt. 12·5, diam. 7·2; alt. of aperture 6·2 mill.

Alt. 10·5, diam. 6·2; alt. of aperture 5·2 mill.

Fernando Noronha Island, off Brazil, living under bark of Mango trees in the garden and on north side of island; also at base of the Peak, north side, under stones, and on *Rat Island* (Ridley).

Bulimus (*Bulimulus*) *ridleyi* E. A. Smith, Journ. Linn. Soc. Zool., xx, p. 501, pl. 30, f. 9 (July 31, 1890).

B. americanus Dall has a longer aperture and more broadly reflexed lip; it is also somewhat larger. The spiral striæ of *B. ridleyi* are often scarcely discernable on specimens deprived of the cuticle but otherwise well preserved.

Mr. Smith writes: "I do not know any species sufficiently near this form wherewith to offer a comparison. It resembles somewhat in form certain species of *Partula;* it faintly recalls, chiefly on account of color, *B. jacobi* of the Galapagos Islands, and the spiral striation, although finer, somewhat resembles that of some of the species of the genus *Plecotrema.*"

Division III. *Bulimuli with the nepionic whorls sculptured with regular, straight or nearly straight vertical riblets.*

The third division of *Bulimulus* is remarkable for the discontinuity of its distribution; one group inhabiting eastern and northeastern South America, another the Galapagos Archipelago, and a third, central and northern Mexico, Lower California and the southcentral and southwestern United States. This probably indicates a former wide extension, with subsequent extinction in the region geographically intermediate between the present habitats of the groups. This contrasts with the distribution of the other two main groups of the genus *Bulimulus,* both of which occupy continuous areas.

In many or most of the species of this division, adequate magnification reveals delicate and close spiral striæ between the vertical riblets of the nepionic shell. This is an incipient condition of what becomes conspicuous in *Neopetræus,* a group which probably arose from this stock.

The shells of this division are almost invariably dull brown or white, often more or less streaked obliquely, but very rarely banded. The lip may be either simple or reflected; and the contour, as in *Bostryx,* varies within the widest limits.

Three subgenera of this group are here recognized, separated geographically and by the general appearance; but it must be freely

admitted that rigid diagnoses are impossible, so great is the range variation within each of the three. The rank of subgenera is, therefore, nominal.

I. PROTOGLYPTUS (p. 84). Eastern and northern South America, Trinidad, etc.

II. NÆSIOTUS (p. 94). Galapagos Islands.

III. ORTHOTOMIUM (p. 125). Central and northern Mexico, Lower California, southern United States.

Subgenus PROTOGLYPTUS Pilsbry, 1897.

Bulimuli with the apical whorls vertically costulate, the shell ovate-conic, usually rather thin and brownish, the outer lip unexpanded, columella foldless, the columellar lip dilated and reflexed.

Distribution: eastern South America, Trinidad and some of the Caribbean Islands.

This group stands somewhat intermediate in conchological characters between the typical Bulimulus (with Leptomerus), *Rhinus*, *Orthotomium* and *Nœsiotus*, with certain features not unlike *Neopetrœus*. It may be regarded as a surviving primitive type, not much modified from the parent stock of the groups named above. Typical *Bulimulus* and *Scutalus* have apparently been differentiated from *Protoglyptus* by the crinkling of the riblets of the nepionic shell; *Neopetrœus* by the development of a system of spirals between the straight riblets, a process culminating in *Drymœus*. *Nœsiotus* and *Orthotomium* are identical with *Protoglyptus* in apical sculpture, and have both been directly dirived, apparently, from this stock.

Key to species.

I. Shell thin, brown or corneous.

a. Unicolored; whorls 7 or less; form ovate or conic.

b. Densely pilose; whorls very convex; aperture decidedly less than half the alt.; alt. 13–14 mill.; whorls 6, *pilosus*, p. 85.

b′. With faint spiral striæ but no hairs; dark reddish-chestnut; aperture decidedly less than half of alt. Alt. 18–22 mill., *chrysaloides*, p. 87.

b″. Pilose when fresh; whorls 7, convex, sutures deep; a faint paler peripheral zone; aperture two-fifths the alt. Alt. 21 mill., *sanctælucіæ*, p. 86.

b'''. Similar to (*b''*), but unicolored, sutures shallow, last whorl wider, v. *luciæ*, p. 86.

b''''. Faint growth lines and cuticular spirals; very thin and fragile; apex densely striolate vertically; whorls 4¾, alt. 10½, diam. 6·6 mill.; aperture over half the length, *eudioptus*, p. 89.

a'. Whorls 7½–9; form slender, long, the alt. more than twice the diam.; often streaked.

b. Hairy; openly perforate, with 8 slightly convex whorls; alt. 20, diam. 9; aperture 8½ mill., *trichodes*, p. 92.

b'. Not hairy.

c. Umbilicus large; 8 slightly convex whorls; alt. 19, diam. 8 mill., *rivasii*, p. 91.

c'. Umbilicus narrow; whorls very convex, *montivagus*, p. 90; *crepundia*, p. 90.

II. Shell solid, more calcareous.

a. None of the riblets of early whorls beaded.

b. Form compact, whorls 7, aperture about ½ alt.; alt. 19–24 mill.: *durus*, p. 87; *ovulum*, p. 88.

b'. Outer lip unexpanded; aperture over half the alt.; alt. 32 mill., *pachys*, p. 88.

a'. Second nepionic whorl with the riblets beaded; solid and calcareous species, *glyptocephalus*, p. 93; *sarcochroa*, 93.

B. PILOSUS (Guppy). Pl. 13, figs. 8, 9, 20.

Shell small, umbilicate, oblong-conic, thin; corneous-brown. Surface but little shining, with oblique growth-lines and very numerous spiral lines of short, delicate, velvety hairs, or the slight scars remaining when they are rubbed off. Spire conic, the apex very obtuse, earlier 1½ whorls delicately vertically costulate (fig. 20), whorls fully 6, very convex, and separated by deep sutures.

Aperture oblique, decidedly over one-third the total length; peristome thin, the basal margin somewhat expanded, columellar margin broadly dilated.

Alt. 13½, diam. 7⅓; alt. of aperture 5½ mill.

Trinidad (Guppy).

Buliminus pilosus GUPPY, Amer. Journ. Conch., vi, p. 310, pl. 17, f. 12 (1871).—*Bulimus pilosus* GUPPY, P. Z. S., 1875, p. 323;

Quart. Journ. of Conch., i, p. 109.—*Bulimulus pilosus* Guppy, Crosse, Journ. de Conchyl., 1890, p. 43, pl. 2, f. 3.—Guppy, Journ. of Conch., vii, p. 218 (1893).—*Bulimulus* (*Leptomerus*) *pilosus* Guppy, Smith, Journ. of Conch., viii, p. 241 (1896).

The whorls are very convex and separated by deep sutures, suggesting *B. constrictus* Pfr., a species with different apical sculpture. This is the smallest of the known *Protoglyptus* species.

B. sanctæluciæ (Smith).

Shell elongated, narrowly rimate, thin, covered with a brown-corneous, little shining epidermis; whorls 7, convex, the earlier two obliquely delicately costulate, the rest ornamented with oblique growth-lines and with spiral punctate and setigerous lines, separated by a simple but deep [profunda] suture; the last whorl paler below and toward the lip, girt about the middle with an inconspicuous narrow, pale zone. Aperture small, whitish, about two-fifths the total length of shell; peristome thin, hardly expanded, the columellar margin broadly reflexed, nearly covering the umbilical chink. Alt. 21, diam. 9; aperture 8½ mill. long, 5 wide. (*Smith*).

St. Lucia (G. A. Ramage).

Bulimus (*Leptomerus*) *sanctæluciæ* Smith, Ann. Mag. N. H. (6), iii, p. 403 (May, 1889).

This species is somewhat intermediate in form between *B. chrysalis* Pfr. and *B. martinicensis* Pfr. It is, however, well distinguished by the sculpture of the apical whorls and the pilose punctured striæ of the rest. The reflexion of the columella also is different. (*Smith*).

Var. luciæ Pilsbry, n. v. Pl. 12, fig. 43.

Shell long, ovate-conic, narrowly umbilicate, *thin;* yellowish-brown or reddish-brown. Surface slightly shining, with oblique growth lines and very numerous spiral lines of closely placed, short, stiff hairlets, mostly or entirely rubbed off in adult shells. Spire long and straightly conic, the apex obtuse, 1¾ nepionic whorls with regular delicate vertical riblets. Whorls 7, somewhat convex, the suture well marked but not deep.

Aperture slightly oblique, irregularly ovate, fleshy-whitish within; peristome thin and simple, the outer margin almost imperceptibly expanded, basal margin well expanded; columella flesh-colored, concave, the margin *flatly* dilated and reflexed. Alt. 22, diam. 12, alt. of aperture 10 mill.

St. Lucia, British West Indies (Robert Swift).

This form differs, apparently, from Smith's unfigured *B. sanctæ-luciæ* in being wider with proportionally larger aperture; is umbilicate rather than rimate behind the flatly reflexed columellar lip, the sutures are not deep but rather superficial, and the color is of uniform tint throughout. Six specimens examined. As it inhabits the same island, and agrees in other characters, I can hardly doubt the specific identity of Swift's shells with those collected by Ramage, but they evidently constitute a marked variety.

B. CHRYSALOIDES Pilsbry. Pl. 9, fig. 52.

Shells perforate, oblong-turrited, thin, deep reddish-chestnut, somewhat paler on the spire; *surface lusterless,* with irregular, indistinct growth-wrinkles and microscopic crowded spiral striæ, very superficial and probably cuticular. Spire long, the apex obtuse, *1⅔ nepionic whorls regularly vertically costellate,* the riblets straight, closer on the latter portion. Whorls 6½, moderately convex, the last a trifle descending in front; sutures impressed.

Aperture small and short, slightly oblique, *short-oval,* contained slightly less than 2½ times in length of shell, brownish-vinous within; peristome thin, *slightly expanded;* columellar margin expanded, not reflexed, forming a long triangular plate *concave on the apertural side;* the inner edge of columella rather acute, slightly concave.

Alt. 22, diam. 10 mill.; alt. of aperture 8½ mill.

Alt. 18⅝, diam. 9¾ mill.; alt. of aperture 8⅓ mill.

Martinique.

Bulimulus chrysaloides PILSBRY, Proc. Acad. Nat. Sci. Phila., p. 20 (Feb. 23, 1897).

The nepionic whorls, when unworn, show a vertically ribbed sculpture very different from the reticulate apices of the *B. exilis* group, but like the apex of *B. sanctæluciæ* Smith. The peculiar columella also somewhat resembles that species, which in proportions is also quite similar, but the post-nepionic sculpture and dark color of *chrysaloides* are unlike Smith's form.

B. DURUS (Spix). Pl. 13, figs, 5, 6, 24.

Shell umbilicated, ovate-conic, rather solid, opaque-whitish, with a light brown band above and below the peripheral white girdle, the lower band narrow and fading into the whitish color of the base, the upper band more or less diluted above, spire light brown; or sometimes all brown markings are faint or wanting. Surface shining,

finely and irregularly striated, the striæ cut by a few incised spirals; base smoother. Spire conic, apex obtuse; 1¾ apical whorls with regular riblets, which are a trifle curved and finer on the latter part (fig. 24). Whorls 7, slightly convex, the last rounded-oval, not descending.

Aperture subvertical, about half the length of shell, whitish with light brown bands inside; peristome obtuse, with an extremely narrow reflexion, white; the columellar margin dilated above and reflexed. Alt. 24, diam. 14 mill.

Bahia, Brazil.

Bulimus durus SPIX, Test. Bras., p. 5, pl. 6, f. 2.—DESH. in Lam., viii, p. 242.—REEVE, Conch. Icon., pl. 40, f. 253.—PFR., Monogr., ii, p. 104.—*Rhinus durus* W. G. BINNEY, Ann. N. Y. Acad. Sci., iii, p. 124 (dentition and jaw).

The solid, compact form of this species, and its costellate apical whorls, are unlike other described forms except the following two.

B. OVULUM (Reeve). Pl. 12, fig. 48.

Shell narrowly umbilicated, ovate-conic, solid, smoothish, shining, white. Spire conic, rather obtuse; whorls 6½, a little convex, the last slightly longer than the spire. Aperture vertical, oval; peristome simple, white, the columellar margin vertical, dilated at base, vaulted-reflexed, right margin narrowly expanded. Alt. 20, diam. 11 mill.; aperture 11 mill. long, with peristome 8½ wide. (*Pfr.*).

Pernambuco (Pfr.).

Bulimus ovulum REEVE, Conch. Icon., pl. 76, f. 556.—PFR., Monogr., iii, p. 338; iv, p. 399; vi, p. 45.

Described from the "Philippines (Mus. Cuming)" by Reeve, but Pfeiffer corrects the locality as above. Judging from description and figure, it must be very near small and colorless forms of *B. durus;* but the apical sculpture is unknown.

B. PACHYS Pilsbry. Pl. 12, figs. 44, 45.

Shell umbilicate, ovate-conic, solid and strong; surface smoothish, with slight growth-wrinkles, rather regular and close on the spire, and disposed to be interrupted. Spire acutely and straightly conic with subhorizontal sutures, the apex small, obtuse, earlier 1¾ whorls regularly and rather finely costulate vertically. Whorls 7½,

convex; sutures well-impressed, the last hardly descending; last whorl regularly convex and inflated.

Aperture subvertical, ovate, somewhat over half the length of shell, white inside; peristome unexpanded, rather blunt, the outer margin regularly arched, columella slightly concave, its margin broadly reflexed, with a salient angle at junction of reflexion with basal lip; parietal callus moderate; umbilicus deep and rounded.

Alt. 32½, diam. 20; alt. of aperture 18 mill.

Province of Bahia, Brazil (v. d. Busch).

Bulimulus pachys PILSBRY, Proc. Acad. Nat. Sci. Phila., p. 20, Feb. 23, 1897.

The type is a faded, decolored specimen, showing traces of a median white girdle, brown above and slightly so below it, as in *B. durus* Spix. It is considerably like *B. heterotrichus* in size and form, but is unlike that species in the less oblique aperture with blunt, unexpanded outer lip, the differently formed columella and the costulate apical whorls. In general aspect it somewhat resembles Binney's *B. patriarcha*. The columellar lip is pressed in above, unlike that of *B. durus*, which is, besides, a smaller species.

B. EUDIOPTUS Ihering, n. sp. Pl. 14, figs. 16, 17.

Shell small, ovate, narrowly perforate, *very thin and fragile*, light chestnut colored; somewhat transparent, showing the columella through the shell, shining. Sculpture of slight, inconspicuous growth-wrinkles and very delicate cuticular spiral striæ. Spire short, the apex rather obtuse, *nepionic whorls with very fine, close longitudinal riblets*, the intervals densely and lightly scratched spirally. Whorls 4¾, rather convex, the last inflated.

Aperture ovate, slightly more than half the length of the shell, colored within like the outside; outer lip thin and fragile, unexpanded; columellar lip narrowly reflexed above, nearly covering the narrow umbilical perforation; columella concave.

Alt. 10·5, diam. 6·6; alt. of aperture 5·5 mill.

Sao Paulo, Brazil (Dr. H. von Ihering).

More delicate and fragile than any other known member of this or related subgenera, being comparable in this respect to the *Eudioptus* species.

B. MONTIVAGUS (d'Orbigny). Pl. 11, figs. 29, 30; pl. 14, fig. 14, 15.

Shell much elongated, very narrowly umbilicated, thin, smooth or perceptibly striated by growth-lines; spire elongated, conic, obtuse at apex, composed of 9 convex whorls, separated by very deep, crenulated sutures. Aperture small, oblong, the peristome thin, generally a little reflexed; columella straight, flat. The color is fawn, deeper toward the apex; uniform or marked longitudinally with unequally spaced whitish lines. Alt. 20, diam. 7 mill. (*Orb.*).

" *Caballu cuatia,*" *Province of Entre Rios, Argentina,* on moss and dead leaves under trees; *valleys of the extreme eastern Andes provinces of Valle Grande and Laguna, and in the Monte Grande, or great forest separating Santa Cruz de la Sierra from the Prov. Chiquitos,* always in poorly wooded places (Orb.); *Corumbá, Matto Grosso, Brazil,* in crevices of cliffs and on walls (H. H. Smith).

Helix montivaga ORB., Synops., Mag. de Zool., 1835, p. 14.—*B. montivagus* ORB., Voy. dans l'Amér. Mérid., p. 275, pl. 34, f. 1–3.—REEVE, Conch. Icon., f. 475.—PFR., Monogr., ii, p. 112.

At La Laguna, all of the specimens lacked the longitudinal whitish lines. In the Prov. Entre-rios the shells were largest, and constantly marked with unequally spaced longitudinal whitish lines.

The form collected by Mr. H. H. Smith at Corumbá (pl. 14, figs. 14, 15) is russet or corneous-brown, without stripes or with one or a few on the last whorl. The surface is shining and shows very minute spiral cuticular striæ under a strong lens, the striæ, perhaps, very shortly pilose; whorls 8, decidedly convex, the earliest 1½ longitudinally delicately costulate (fig. 14). Alt. 20, diam. 7; alt. of aperture 7 mill. The smallest specimen I have seen measures, alt. 15·2, diam. 5·8; alt. of aperture 5 mill. It is pale corneous with widely and unequally separated oblique chestnut streaks, sometimes accompanied by white streaks.

B. CREPUNDIA (d'Orbigny). Pl. 11, figs. 33, 34.

Shell elongated, turriculate, narrowly umbilicated, the umbilicus in part covered by columella. Thin, appearing smooth to the naked eye, but showing under a strong lens very fine, dense, transverse striation, besides some growth-lines. Spire elongated, conic, the apex very obtuse. Whorls 8, very convex, rounded, separated by a deep suture. Color uniform ashy light fawn.

Aperture quite large, oval, the borders thin and acute, noticeably reflexed; columella straight, inflated in the middle of its length. (*Orb.*).

Alt. 25, diam. 10 mill.

Near Mission of San José, southern part of Prov. Chiquitos, Bolivia, on the ground or under dead leaves (Orb.).

Helix (*Cochlogena*) *crepundia* ORB., Mag. de Zool., 1835, p. 14.—*Bulimus crepundia* ORB., Voy., p. 275, pl. 33, f. 18, 19.—PFR., Monogr., ii, p. 173; iii, 412; iv, 471; vi, 114.—*Buliminus crepundius* BECK, Index Moll., p. 71.—*Bulimus constrictus* REEVE, C. Icon., pl. 47, f. 307.—*B. redditus* REEVE, *ibid.*, in addenda.—*?Bulimus crepundia* PARAVICINI, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, ix, no. 181, p. 7.

Most nearly allied to *B. montivagus*, but the size is double, the form wider, mouth rounder, columella inflated, and especially distinguished by the spiral striæ.

The subgeneric position is uncertain. Pfeiffer gives the following diagnosis:

Shell profoundly rimate, subperforate, turrited, oblong, thin, nearly smooth (very minutely decussated when seen under the lens), diaphanous; brownish-ashen. Spire lengthened, the apex somewhat obtuse. Whorls 7½–8, convex, the last about equal to two-fifths the total alt., a trifle compressed at base. Columella somewhat receding. Aperture a little oblique, oval; peristome simple, unexpanded; columellar margin dilated and wide. Alt. 22, diam. 9 mill.; aperture 9 mill. long, 4⅔ wide inside. (*Pfr.*).

B. RIVASII (d'Orbigny). Pl. 12, figs. 40, 41.

Shell long-conic, turriculate, with a wide and deep umbilicus; thin, smooth, translucid, grayish-brown, ornamented with longitudinal lines of brown. Spire rather short, conic, acute. Whorls 8, very little inflated, short; suture not impressed. Aperture oblong, subangulate; lip thin, acute; columella straight, angular in front. Length 19, diam. 8 mill. (*Orb.*).

Cuesta de Petaca, and the ravines along the Rio Grande, eastern foothills of the Bolivian Andes, under stones (Orb.).

B. rivasii D'ORB., Voy. dans l'Amér. Mérid., p. 276, pl. 34, f. 8–10.—PFR., Monogr., ii, 155; iv, 406.—? REEVE, Conch. Icon., pl. 20, f. 122.

In form allied to *montivagus* and *crepundia*, but distinguished by the angular aperture, shorter spire and entirely smooth texture. (*Orb.*).

The form described by Reeve is certainly a marked variety. It is described as follows.

VAR. Pl. 12, fig. 46.

Shell acuminately oblong, thin; whorls 8, convex, aperture rather small, lip simple. Opaque-white, with longitudinal transparent horny streaks and lines. Alt. 19½ mill. (*Reeve*).

Near Chilon, Bolivia, under dead trunks of cacti (Bridges).

Pfeiffer describes *B. rivasii* as follows: Shell narrowly umbilicated, ovate turrited, rather solid and smooth; pale corneous, with sparse streaks of chestnut. Spire pyramidal, rather acute, whorls 7½–8, a little convex, narrow, the last a little over one-third the length of shell, somewhat compressed at base. Columella a trifle receding.

Aperture slightly oblique, oblong-oval; peristome a mere trifle expanded, the outer lip arcuate above, then a little straightened; columellar lip dilated and wide. (*Pfr.*).

Alt. 18½, diam. 8 mill.; alt. of aperture 7½ mill.

B. TRICHODES (d'Orbigny). Pl. 12, figs. 49, 50, 51, 52.

Shell openly perforate, ovate-elongate, thin, striatulate-granulate, beset with very short hairs, corneous, ornamented with close whitish longitudinal lines; spire lengthened, the apex acute. Whorls 8, a little convex, the last nearly equalling two-fifths the length of shell. Aperture oblong-oval, the peristome simple, acute, right margin expanded a little, columellar margin vaulted, reflexed, wide; columella straight, a little receding. Length 20, diam. 9 mill.; aperture 8½ mill. long, 4 wide in the middle. (*Pfr.*).

Santa Cruz de la Sierra, Bolivia, in gardens (Orb.).

Helix trichodes ORB., Mag. de Zool., 1835, p. 12.—*Bulimus trichodes* ORB., Voy., p. 277, pl. 33, f. 1–5.—PFR., in Conchyl. Cab., p. 150, pl. 39, f. 12, 13; Monogr., ii, p. 112; iii, p. 347; iv, p. 413; vi, p. 58.—REEVE, Conch. Icon., pl. 75, f. 547.—*Buliminus trichodes* BECK.—*Bulimus crepundia* REEVE (not Orb.), Conch. Icon., pl. 47, f. 300.

Apical sculpture unknown. Orbigny considers it closely allied to *B. montivagus* and *B. crepundia*, from which it differs in the less

lengthened form, shallower sutures, rounder aperture and the clothing of hairs. It is very abundant in gardens in the town of Santa Cruz de la Sierra, burying itself in the earth during the dry season.

* * *

The following species differ considerably from those just described. They are solid, cretaceous Bulimuli with *the apex very obtuse*, with apical dimple; first whorl sculptured with curved spaced riblets, *second whorl with these riblets beaded.* Aperture about half the length of shell, with obtuse, unexpanded lip.

B. GLYPTOCEPHALUS Pilsbry. Pl. 5, figs. 62, 63, 64.

Shell narrowly perforated, long ovate, solid and thick, of *chalky texture. White* or bluish-white, *the apical whorl buff*, the next bluish below, pale above. Surface irregularly and coarsely *wrinkle-striate and conspicuously malleated; apical whorl with conspicuous, arcuate riblets*, becoming closer and *beaded on the second whorl.* Spire conic, the *apex very obtuse*, sutures impressed. Whorls 5½, weakly convex, the last suture slightly more descending along the latter half, and consequently a trifle oblique to the others.

Aperture a trifle exceeding half the total alt. of shell, subvertical, white inside, with a faint, narrow band at position of the periphery and another wide one above; *outer lip blunt, obtuse, not expanded;* columella concave below, straighter above, the columellar region broadly dilated above, reducing the umbilicus to a chink; parietal callus white, rather thin. Alt. 31, diam. 17 mill.; alt. of aperture 15½ mill.

Peru (A. Agassiz).

Bulimulus glyptocephalus PILSBRY, Proc. Acad. Nat. Sci. Phila., p. 21, Feb. 23, 1897.

A peculiar form, unlike any Peruvian species known to me except the next, in the characters of the earlier whorls. It differs from the following species in its elliptical-ovate shape and larger aperture.

B. SARCOCHROUS Pilsbry. Pl. 5, figs. 65, 66.

Shell narrowly umbilicated, ovate-conic, solid and strong. Fleshy-white, becoming flesh-pink and then brownish above, the earlier two whorls brown below, white above. Surface irregularly, weakly striate, more wrinkled below the sutures, faintly malleated on the body-whorl: apical sculpture as in the preceding species, except that the riblets are less prominent and are much finer and

closer on the second whorl. Spire straightly conic, the *apex very obtuse.* Whorls 5½, nearly flat, the last one not more rapidly descending than the rest.

Aperture ovate, one-half the alt. of the shell, vertical, light brown inside with a faint, narrow, light band at position of the periphery, and white within the lip-edge; *outer lip obtuse* and rather thick, not expanded; columella with an oblique fold above, the columellar margin well dilated, rounded. Alt. 29, diam. 16 mill.; alt. of aperture 14½ mill.

Peru.

Bulimulus sarcochrous PILSBRY, Proc. Acad. Nat. Sci. Phila., p. 21, Feb. 23, 1897.

Closely allied to the preceding species; but the spire is more slender, the umbilicus larger, surface less malleated and the columellar fold more conspicuous. The apical riblets are finer and closer, less coarsely granulated on the second whorl.

Subgenus NAESIOTUS Albers, 1850.

Nœsiotus ALBERS, Heliceen, p. 162, 1850. Type *B. nux.*—DALL, Proc. Acad. Nat. Sci. Phila., 1896, p. 426.—*Rhaphiellus* PFR., Versuch einer Anordnung der Heliceen nach natürlichen Gruppen. Malak. Blätter, II, p. 160, 1855. Type *B. achatinellinus.*—MARTENS in Albers, Ed. ii, p. 238, 1860 (Sect. *Bulimini*).—*Omphalostyla* H. & A. ADAMS, Gen. Rec. Moll., ii, p. 161, 1855; not of Schlueter, Syst. Verz., p. 7, 1838.—*Nesiotes* MARTENS, in Albers, ed. ii, pp. 220–21, 1860.—*Nesiotus* CLESSIN, in Pfeiffer, Nom. Hel. Viv., p. 254, 1881.—*Ataxus* sp. CLESSIN, *op. cit.*, p. 253.—*Pelecostoma* REIBISCH (*ex parte*) in Isis, Abh. 3, p. 25, 1892.

Perforate or rimate Bulimuli with vertically ribbed or striate nepionic whorls, the contour varying from ovate to slender and turrited, surface wrinkled or nearly smooth, generally with spiral striæ; aperture ovate or irregular; peristome varying from simple to expanded, sometimes with dentiform callosities; the columella entire or truncate. Type *B. nux.*

Distribution, Galapagos Islands.

The land shells of the Galapagos Islands have recently been elaborately treated of by Dall (Insular Land Shell Faunas, etc., Proc. Acad. Nat. Sci. Phila., 1896). In the following pages his conclusions have been adopted, so far as the scope of the Manual ad-

mitted. I have not hesitated to quote his observations both on the general aspect of the fauna and on nearly all the species, as they seem worthy of all confidence, and were based upon a mass of material greater than any former malacologist has studied.

No definition can be made which would cover all forms of *Nœsiotus* and exclude parallel species of similar contour from other regions. The group is, however, a natural one, the species having doubtless a common ancestry. The sculpture of the nepionic shell indicates that the Galapagos group arose from the division of *Bulimulus* now distributed over northern Mexico and Lower California, with a few forms in eastern South America. It is not allied to the groups now characteristic of Colombia, Equador, Peru and Chili.

The anatomical details offer no characters by which the Galapagos species may be differentiated from many of the *Bulimuli* of the mainland. As Dall writes: "The utmost that can be said is that *Nœsiotus* is a convenient term for the geographical group inhabiting the Galapagos Islands, and, as such, we may retain it without giving way to the delusion that it stands for anything more important."

In *Nœsiotus* "the apex (pl. 24, fig. 35) is nearer to that of *Orthotomium* than to that of *Bulimulus* s. s. It is characterized invariably by *vertical riblets* sometimes strong and with subequal furrowed interspaces; sometimes distant with wider, flat interspaces, and sometimes extremely delicate and fine; but, except when worn, always unbroken and regular and with extremely fine spiral striæ visible in a good light, between the riblets (pl. 24, fig. 36). The apex always has a dimple or funicle over the axis, but the upper margin of this is rounded, never keeled, as in some species of *Orthotomium*. It often happens, especially among those species which have the riblets low and fine, that they are broken by wear on the periphery of the nepionic whorls, thus suggesting the *Bulimulus* type; or even that they may be entirely removed, while the polished surface shows no trace of erosion. But in young, fresh specimens, they may always be found unbroken and regular, except in the case of rare abnormal individuals. Of the latter, I have come across only one or two in all my series of several hundreds of specimens" (*Dall*).

"The nomenclature of this section has had serious vicissitudes, as indicated by the above synonymy. The group was named *Nœsiotus* by Albers who gave no derivation for it, though the sound of the

word naturally inclined the hearer to suppose that it was suggested by νησιώτης, islanders, and on this assumption von Martens proceeded to modify the spelling to *Nesiotes*, which would be a proper latinization of that Greek word. There is no rule of nomenclature which authorizes any one to supply a gratuitous derivation for a word published without any; still less because the original does not agree with the later assumption is any one authorized to modify or destroy a name properly proposed in other respects. Consequently von Marten's substitute cannot be accepted.

"In describing his *Bulimus achatellinus*, Forbes says that it 'is unlike any known *Bulimus*, and its characters distinctly indicate affinity with the *Achatinellinæ*.' Elsewhere he speaks of it 'distantly,' indicating 'affinity with the fauna of the Sandwich Islands.' This was not an unnatural conclusion when drawn from a few specimens, but, as is elsewhere shown in this paper, rests upon purely superficial characters. Actually the species is American in its relations, and is very closely related in some varieties of *B. nux*, from which Protean species it may even be an offshoot. Consequently the sectional name [*Rhaphiellus*] proposed for it must fall into the synonymy of that given earlier to *B. nux* and its allies. It is probably due to the great rarity of this species that its situation in accepted systems has not been challenged before this; certainly if it had been as common as *B. nux*, the facts could hardly have escaped attention so long. I have not found anywhere any reasons stated for putting the species into *Buliminus* rather than *Bulimulus* where it really belongs.

The name *Omphalostyla* was applied by Schlüter to *Bulimi* with the pillar vertically twisted, and his sole example was the African shell, since better known under the name *Achatina ustulata* (Lam.) Menke. It was probably to some accidental confusion of the species with the *Bulimus ustulatus* Sby. of the Galapagos, that is due the application by the brothers Adams of Schlüter's name to the *Nœsioti*.

"The type of the section *Pelecostoma* Reibisch, is a *Nœsiotus* which shows a ridge at the base of the pillar which gives a peculiar channelled aspect to the adjacent part of the aperture. This feature will be found more or less distinctly present in some specimens of almost any Galapagos species of which a large number is examined, showing that it is dynamic or individual, and not of systematic value. The second species of this "section" is *Leptinaria chat-*

hamensis, a species belonging to a totally distinct group. The name *Pelecostoma*, therefore, may be safely laid away on the synonymic shelf."

"The Galapagos Islands, lying under the equator about 90° west of Greenwich, comprise two principal groups separated by nearly 1,200 fathoms of water. One of these groups, northwest of the other, contains only Culpepper (550 ft.) and Wenman (830 ft. elevation) Islands and a few insignificant rocks. Culpepper, owing to its small elevation, is nearly barren, while Wenman shows on its upper surface a thin coating of grass and other vegetation. From neither of these has any collection been made or is any land shell known.

"The main group of the Galapagos rests on an elevation of the sea bottom included within the 1,000 fathom line. It may be provisionally divided into three groups, a southeastern, a central and a northeastern, in all about a dozen islands and some smaller islets and rocks.

"The southeastern group comprises Charles, Chatham, Hood and Barrington Islands. Hood is destitute of water in the dry season and green only in the wet season, owing to its small elevation which does not bring it into the region of condensing clouds. Much of the surface is covered with blocks of lava. Chatham and Charles are among the most fertile islands of the group.

"The central islands include the largest of the whole: Albemarle, which appears to consist of several primitive islands united by low areas of volcanic material; Narborough, which exhibited volcanic activity as late as 1836; James; Indefatigable, and the much smaller Duncan Island, besides a number of islets. Of these, Narborough, said to be very fertile, has not been explored at all for land shells.

"The northeastern group comprises three comparatively small islands, Abingdon, Bindloe and Tower. Three land shells, two of which are *Auriculidæ*, are known from Bindloe; the faunæ of Abingdon and Tower being still unknown.

"The sea currents about the islands and between them and the mainland are very complicated. In a general way it may be said that two currents converge upon the islands, one from an east-northeasterly direction from the Gulf of Panama, and another from a southeasterly direction from the Peruvian coast. Both are strong currents; both have doubtless contributed their aid in populating

the Galapagos, but in this the Panama current seems to have predominated, not only because it has a shorter traverse, but because around the Gulf of Panama, and on the banks of the rivers falling into it, a luxuriant fauna and flora are found close to the sea while along the Peruvian coast only in time of freshet could any large quantity of débris be expected to reach the waters of the current, owing to the aridity of the immediate shores. The two currents join forces at some distance eastward from the islands, and pour through the passages between them with considerable force. Professor Alexander Agassiz has shown how much terrigenous material the Panama current bears, and that there is no reason to doubt that trees still bearing leaves and with some of their branches above water might be carried from the Gulf and cast upon the islands, and that, at least during the rainy season and in favorable years, there would be opportunities for animals so carried, especially land shells glued by the epiphragm to the bark of branches, to gain vegetation on the shores where they could support life and propagate their kind. Though unproven, yet there can be little doubt that in this way the land mollusk fauna of the islands was introduced and preserved" (*Dall*).

That these and other means of transport have been only in rare instances successful in introducing new members to the fauna is evident when we consider that the whole of the *Bulimulidæ* belong to one group and apparently owe their existence to one importation, and the other strictly terrestrial genera yet known are *Helicina* (1 species), *Leptinaria* (2), *Succinea* (4), *Pupa* (2 or 3), *Conulus* (1), *Vitrea* (1) and one species resembling what is generally known as *Microcystis*. In all, seven or eight genera, most of them represented by but few species. Further investigation will doubtless increase the number of genera and species, but will hardly modify the conclusion that the mollusk fauna of these islands was originally introduced by the chance means of transport alluded to above, and that there were very few successful immigrations.

The large element common to several of the islands lends color to the belief of Dr. Baur that the archipelago has resulted from the disintegration of a single large island; but while this seems extremely probable, the theory that this island was formerly connected with the continent derives but slight support from what is now known of the land mollusks.

B. ACHATELLINUS (Forbes). Pl. 16, figs. 26–31.

Shell perforated, ovate-pyramidal with long, conic spire, rather thin; variously colored, being banded with chestnut on an olivaceous or whitish ground, or chestnut below, white above, always with a white line below the suture; *surface smooth and glossy*, like an *Achatinella* with slight growth-wrinkles and *an impressed band below the suture, pinched up into tubercles at irregular intervals.* Whorls 7½, slightly convex.

Aperture small, about one-third the length of the shell, banded within; outer lip unexpanded, columellar lip triangularly, flatly dilated above; columella subvertical.

Alt. 17½, diam. 8½; alt. of aperture 6 mill. (specimen).

Alt. 22, diam. 11; alt. of aperture 8½ mill. (Pfr.).

Upper levels of Chatham Island on trees and bushes (Kellett, Wolf and Baur); *Hood Island* (Habel, fide Wimmer).

Bulimus achatellinus FBS., P. Z. S., 1850, p. 56, pl. 9, figs. 5 a–b.—*Bulimus achatinellinus* PFR., Mon. Hel. Viv, III, p. 429, 1853; in Chemn. Conch. Cab., ed. ii, *Bulimus*, p. 93, pl. 31, figs. 19, 20; Monogr. IV, p. 492, 1859.—*Bulimus* (*Rhaphiellus*) *achatinellinus* PFR., in Malak. Blätt., II, p. 160, 1855.—*Bulimulus* (*Omphalostyla*) *achatinellus* H. & A. Ads., Gen. Rec. Moll. II, p. 161, 1855.—WIMMER, Sitz. Akad. Wiss. Wien., lxxx, p. 43, 1879.—*Buliminus* (*Rhaphiellus*) *achatinellinus* MARTENS, in Albers, Heliceen, ed. ii, p. 238, 1860.—REIBISCH, Isis, 1892, p. 15, t. ii, fig. 8.—*Bulimina* (*Rhaphiellus*) *achatinellina* PFR., Nom. Hel., Viv, p. 300, 1881.—*Bulimulus* (*Rhaphiellus*) *achatinellinus* STEARNS, Proc. U. S. Nat. Mus., XVI, p. 428, 1893.—*Bulimulus* (*Næsiotus*) *achatellinus* Forbes, DALL, Proc. Acad. Nat. Sci. Phila., 1896, p. 428, pl. 17, f. 13 (jaw).

The gloss and coloring of this species are quite *Achatinella*-like. Dall remarks:

"The jaw is like the jaw of *B. nux*, with about 18 irregular, flat, plate-like ribs, whose blunt ends denticulate the margin, especially the cutting edge. The outer margin of these plates is a little raised and thickened, the color is pale amber, darker where thickest. The radula was rather broad, the single teeth did not differ in outline from those of *B. nux* more than those of one specimen of *nux* differs from those of another. The number of laterals is 14, of marginals 23, the formula 23·14·1·14·23.

"It will be observed from these facts that nothing in the dentition of *B. achatellinus* justifies the presumption that it deserves a section

to itself. In Dr. Baur's specimen, the nucleus is delicately transversely ribbed, the vertex almost umbilicate, the earlier whorls nearly white and opaque, pinched up into irregular little tubercles at the suture; the later whorls have revolving dark brown color bands, separated by whitish interspaces covered with a yellowish epidermis. The base is mostly pale, with a dark band around the umbilicus. The outer lip is sharp-edged, and the umbilicus small. The pillar is short and straight.

"A specimen sent by Cuming to Dr. Lea is not so large, and is darker colored, the ground color being an olivaceous brown with a narrow chestnut band at the periphery; the base pale and the umbilicus entirely closed. The nodulous band in front of the suture is present and of a whitish color.

"The name applied by Forbes was *achatellinus*, which, by several authors, on the assumption that it was intended as a diminutive of *Achatinella*, has been emended to *achatinellinus*, a most awkward and clumsy word. But it is just as likely that he intended the word as a diminutive of the same root as *Achatina;* and, at any rate, no one has the right to make changes on an unsupported assumption, for which reason the original form is retained here."

B. NUX (Broderip). Pl. 16, figs. 31–38.

Shell umbilicate, ovate-conic, solid; chestnut variously modified by olivaceous, whitish or yellowish suffusion, paler on the spire, and with a pale or yellow line below the suture, the apex either white or purple. Surface somewhat shining, with rather strong growth-wrinkles, decussated or cut into long beads by few or many spiral incised lines. Spire conic. Whorls 7–7½, slightly convex, separated by well impressed sutures. Aperture squarish ovate, light within, with a dark submargin; outer lip somewhat straightened in the middle, the columellar lip built forward and dilated; columella generally subtruncate below.

Alt. 20, diam. 11½–12; alt. of aperture 9–9½ mill.

Galapagos Is.: Original typical *nux* of Broderip on bushes, *Charles Island, in the upper wooded region;* mut. *nuciformis, Chatham Island* (U. S. Fish Commission); mut. *incrassatus*, on the under side of leaves hibernating, 1,600 feet above the sea, on the *S.-W. end of Chatham Island* (Baur); mut. figured by Reeve in Conch. Icon., abundant on *Charles Island* (U. S. Fish Commission); variety *verrucosus, Chatham Island;* var. *asperatus, Charles Island*, abundant (Wolf and U. S. Fish Commission).

Bulinus nux Brod., P. Z. S., 1832, p. 125 (Charles Id.); Sby., Conch. Ill, p. 6, figs. 37, 37*, 1833.—*Bulimus nux* Desh. in Lam. An. s. Vert., ed. ii, vol. viii, p. 276, 1838.—Pfr., Mon. Hel. Viv., II, p. 183, 1848.—Reeve, Conch. Icon., pl. xxiii, fig. 150 (not typical); Smith, P. Z. S., 1877, p. 72.—*Buliminus nux* Beck, Ind. Moll., p. 70, 1838.—*Bulimus* (*Nœsiotus*) *nux* Albers, Heliceen, p. 162.—*Bulimulus* (*Omphalostyla*) *nux* H. & A. Adams, Gen. Rec. Moll., II, p. 161, 1855.—*Bulimulus* (*Nesiotes*) *nux* Martens, in Albers ed II, p. 220, 1860.—*Bulimulus* (*Nœsiotus*) *nux* Pfr., Nom. Hel. Viv., p. 254, 1881.—*Bulimus nuciformis* Petit, Journal de Conchyl., IV, p. 365, pl. xi, fig. 7, 1853.—Pfr., Mon. Hel. Viv., IV, p. 410, 1859.—*Bulimus* (*Nœsiotus*) *nuciformis* Pfr., Mal. Blatt., ii, Vers., p. 161, 1854.—*Bulimulus* (*Nesiotes*) *nuciformis* Martens in Albers, ed. ii, p. 220, 1860.—*Bulimulus* (*Nœsiotus*) *nuciformis* Pfr., Nom. Hel. Viv., p. 254, 1881.—*Bulimus incrassatus* Pfr., P. Z. S., 1852, p. 157; in Chemn. Conch. Cab., ed. ii, *Bulimus*, 79, pl. 30, figs. 13, 14; Mon. Hel. Viv., III, p. 415, 1853.—*Bulimulus* (*Omphalostyla*) *incrassatus* H. & A. Ads., Gen. Rec. Moll., II, p. 161, 1855.—*Bulimulus unifasciatus* Reibisch (non Sby.) Isis, 1892, p. 32, pl. i, fig. 1, *not* p. 15.—*Bulimulus* (*Nœsiotus*) *nux* Reibisch, Isis, 1892, p. 15.—*Bulimulus* (*Nœsiotus*) *incrassatus* Reibisch, Isis, 1892, p. 16, t. i. fig. 4a; var. *sulcatus* Reib., Ibid. p. 16, t. i, figs. 4b c; var. *nuciformis* Reib., Ibid., p. 16, t. i, fig. 4d.—*Bulimulus* (*Nœsiotus*) *nux* Stearns, Proc. U. S. Nat. Mus., xvi, pp. 376–381, 425, 426, 1893.—Dall, Proc. Acad. N. S. P., 1896, p. 429, pl. 16, f. 6 (genitalia), pl. 17, f. 10 (dentition).

Type of the section *Nœsiotus*. *B. nuciformis* Petit is practically a typical *nux;* while Reeves' *nux* (pl. 16, figs. 33), is a rather heavier form with quadrate aperture and thick lip.

"The synonymy exhibits, almost as clearly as the specimens, the great variability of this species. The facts also seem to indicate quite positively that a great proportion of this variability in this instance is due quite as much to an intrinsic tendency to vary in the matter of color and form as to any direct influence of the environment promoting by special circumstances any special variation. At least, while it is not questionable that some of the variations might easily be made permanent by natural selection, it is probable, as yet, that matters have not reached that stage, since the evidence of collectors seems to establish the fact that the different variations of color and form are found indiscriminately in the same region and under the same conditions. Further and more precise observation

is needed to establish this beyond controversy, but at present there seems no escape from this conclusion " (*Dall*).

Form *incrassatus* (Pfr.). Pl. 16, figs. 42, 43, 44, 45.

The form described as *B. incrassatus* is quite solid, sculptured with rather strong oblique folds, which are yellow on a deep chestnut ground; incised spirals few; apex purple-black.

Var. *verrucosus* (Pfr.). Pl. 16, fig. 39.

Shell openly and compressed umbilicate, ovate-conic, solid, sculptured with somewhat interrupted folds and oblong warts; brown variegated with paler. Spire conic, rather acute, sutures subcanaliculate. Whorls 7½, rather flat, the last about three-sevenths the total alt., rounded at base. Aperture subvertical, truncate-oval, subangular at columella, livid inside; peristome straight, brown-bordered inside, the columellar margin dilated, spreading. Columella lightly folded. Alt. 23, diam. 11½, alt. aperture 11 mill. (*Pfr.*).

Bulimus verrucosus Pfr., P. Z. S., 1885, p. 116 (Gal. Is.); Mon. Hel. Viv, IV, p. 475, 1859.—*Bulimus* (*Nœsiotus*) *verrucosus* Pfr., Mal. Blätt., ii, Vers., p. 161, 1854.—*Bulimulus* (*Nœsiotus*) *verrucosus* Pfr., Nom. Hel. Viv, p. 254, 1881.—Reibisch, Isis, 1892, p. 15. —*Bulimulus asperatus* Reibisch (non Pfr.), Isis, 1892, pl. 1, fig. 3 (syn. excl.).—*B. nux* var. *verrucosus* Pfr., Dall, *l. c.*

Var. *asperatus* (Albers). Pl. 16, figs. 40, 41.

Shell deeply rimate-umbilicate, ovate-pyramidal, solid, irregularly warty from spiral sulci and longitudinal wrinkles; buff whitish under a deciduous cuticle. Spire conic, the apex acute; suture crispate, subexcavated. Whorls 7, slightly convex, the embryonal smooth, the last about as long as the spire, compressed at base. Aperture vertical, oblong, angular at base, white inside; peristome simple, acute, the margins parallel, joined by a thin callus; columellar margin much dilated, vaultingly spreading. Columella straightened, descending to the base of the aperture.

Alt. 24, diam. 11½; alt. of aperture 12 mill. (*Pfr.*).

Bulimus asperatus Albers, Malak. Blätt., IV, p. 98, 1857.—Pfr., Mon. Hel. Viv, IV, p. 475, 1859; VI, p. 121; Novit. Conch., IV, p. 145, pl. 133, figs. 8, 9.—*Bulimulus* (*Nesiotus*) *asperatus* Martens in Albers Heliceen, ed. ii, p. 220, 1860.—*Bulimulus* (*Nœsiotus*) *asperatus* Pfr., Nom. Hel. Viv, p. 254, 1881; not of Reibisch, Isis, 1892, pl. 1, fig. 3,=*verrucosus* var.—*Bulimulus invalidus* Reibisch, Isis, 1892, p. 17, t. 1, fig. 6.

B. RUGULOSUS (Sowerby). Pl. 16, figs. 46, 47.

Shell rimate, oblong turrited, longitudinally wrinkled, granulated by elevated concentric lines. Brown, with two rufous girdles; whorls 8, convex, the last over a third the total length of shell, compressed laterally.

Aperture oblong; peristome simple, a trifle expanded, the margins subparallel, joined by a callus, the right margin lightly arcuate above, columellar margin dilated, vaulted and spreading. Alt. 21, diam. 8, alt. of aperture 8 mill. (*Pfr.*).

Galapagos Is.: Under stones near the shore, *Blackbeach Road, Charles Island* (Dr. Baur); *Charles Island* (Darwin and Wolf); *Chatham Island* (Darwin, Kellett and Cuming).

Bulinus rugulosus SBY., Conch. Ill. Part 142, fig. 87 (a, b), 1839.—*Bulimus rugulosus* PFR., Mon. Hel. Viv., II, p. 113, 1848.—*Bulimus eschariferus* REEVE, Conch. Icon., pl. xx, no. 121, (text, figure excluded), 1848, not of Sowerby.—*Bulimulus* (*Omphalostyla*) *rugulosus* H. & A. ADAMS, Gen. Rec. Moll., II, p. 161, 1855.—*Bulimulus* (*Nœsiotus*) *rugulosus* PFR., Nom. Hel. Viv, p. 254, 1881.—ANCEY, Bull. Soc. Mal. France, IV, p. 294, 1887, (Chatham Island).—STEARNS, Proc. U. S. Nat. Mus., xvi, pp. 381, 426, 1893.—DALL, Proc. Acad. N. S. Phila., 1896, p. 431, pl. 17, f. 1 (jaw).—*B. rugulosus* var. *infuscata* ANCEY, op. cit., p. 294, 1887. Not *B. rugulosus* REIBISCH, Isis, 1892, p. 19, pl. 1, figs. 11 a–b,=*B. perspectivus* Pfr.

Decidedly narrower than *B. nux*. Dall writes: "Jaw thin, membranaceous, light horn-colored, low, wide, arcuate, of equal height throughout, ending bluntly; anterior surface with about 20 broad, flat ribs, their outer edges reinforced, the margins of the jaw squarely denticulated by the projecting ends of the ribs.

"Some varieties of *B. nux* approach this species quite closely, especially that to which Reibisch gave the name of *invalidus*."

In var. *infuscatus* Ancey, the bands spread, forming the ground-color of the shell, leaving only a narrow lighter zone between them.

Var. *nudus* Reibisch. Pl. 22, fig. 1.

Shell long-conic, fusiform, perforate, rather solid, irregularly plicate or ribbed, with one white band; spire acute; suture moderate, nodulous. Whorls 8¼, convex, equally increasing, the nucleus smooth (?). Aperture a little oblique, semioval; peristome simple, the margins joined by a thin callus, right margin angularly adnate

above, arcuately joined with the straightened columella. Alt. nearly 18, greater diam. 8, lesser 7¼ mill.; aperture 6 mill. long, 4 wide. (*Reibisch*).

Charles Island (Wolf).

Bulimulus (*Næsiotus*) *nudus* REIB., Isis, 1892, p. 21, pl. 1, f. 15.

Described from two dead shells. It is placed under *B. rugulosus* as a doubtful synonym by Dall. "In form this species stands between *sculpturatus* and *rugiferus;* it is mainly differentiated from these by the greater size and less pronounced sculpture." (*Reibisch*).

B. PLANOSPIRA Ancey. Pl. 16, fig. 48.

Shell rimate, oblong with long spire; brown, lighter above, with two purple-brown spiral bands; rather thin. Spire distinctly attenuated above, the apex obtuse; nepionic 2¼ whorls vertically ribbed, the riblets becoming much closer on the latter half of the last; following whorls with *unequally spaced obliquely longitudinal narrow but strong folds, crossed by crowded cord- and thread-like spiral striæ.* Whorls about 7, very convex, the last two tumid below the deeply constricting sutures; last whorl somewhat flattened peripherally.

Aperture oblong, slightly oblique, purple-banded inside; peristome thin, simple; columellar margin wide, white.

Alt. 18, diam. 8 mill.; aperture 7 mill. high, 5 wide.

Northeast end of Charles Island, at about 200 feet (Dr. Baur).

Bulimus eschariferus REEVE, Conch. Icon., pl. xx, fig. 121 (bad, text excl.), 1848.—*Bulimulus rugulosus* var. *planospira* ANCEY, Bull. Soc. Mal. de France, IV, p. 294, 1887.—*Bulimulus* (*Næsiotus*) *planospira* Anc., DALL, Proc. A. N. S. Phila., 1896, p. 432, pl. 16, f. 3.

"This is one of the most elegant species of the group. It is very closely related to *B. rugulosus* from which it may be discriminated by its larger size and greater number of whorls, and by the deeper suture and more lax manner in which the last whorl is coiled. In *B. planospira* the spiral sculpture is usually more elevated and conspicuous. It has been found only on a limited portion of Charles Island, while *rugulosus* is common on both Charles and Chatham." (*Dall*).

B. USTULATUS (Sowerby). Pl. 23, figs. 16; pl. 16, figs. 49–52.

Shell small, umbilicate, oblong with elevated spire, rather thin but solid. Rusty brown, with irregular oblique yellow streaks, or

yellow with two interrupted dark brown bands; rather shining; sculpture of very irregularly spaced, obliquely longitudinal yellow folds, showing decussating spirals above, but only obscurely on the last whorl. Spire long conic, the apex obtuse, nearly 2 earlier whorls forming the costellate nepionic shell. Whorls 6½, convex, the last rounded.

Aperture contained 2½ times in length of the shell, whitish within with a brown margin toward the lip-edge; peristome acute, outer lip strongly arcuate above, columellar lip dilated above, white; columella short, vertical.

Alt. 13⅜, diam. 7, alt. of aperture 5⅛ mill.

Charles Island (Cuming).

Bulinus ustulatus SBY., P. Z. S., 1833, p. 72, (Charles Island); Conch. Ill., p. 6, fig. 42, 1833.—*Bulimus ustulatus* DESH. in Lam. An. s. Vert., ed. II, vol. viii, p. 279, 1838.—PFR., Mon. Hel. Viv., II, p. 217, 1848; in Chemn. Conch. Cab. ed. II, *Bulimus*, t. 62, figs. 16–18.—REEVE, Conch. Icon., pl. xxi, fig. 130, 1848.—*Buliminus ustulatus* BECK, Ind. Moll., p. 70, 1838.—*Bulimulus* (*Omphalostyla*) *ustulatus* H. & A. AD., Gen. Rec. Moll., II, p. 161, 1855.—*Bulimus* (*Nœsiotus*) *ustulatus* ALBERS, Heliceen, p. 162, 1850.—*Bulimulus* (*Nesiotes*) *ustulatus* MARTENS in Albers, ed. ii, p. 221, 1860.—*Bulimulus* (*Nœsiotus*) *ustulatus* PFR., Nom. Hel. Viv., p. 254, 1881.—STEARNS, Proc. U. S. Nat. Mus., xvi, p. 427, 1893.—DALL, Proc. Acad. Nat. Sci. Phila., 1896, p. 432.—*Bulimulus* (*Nœsiotus*) *venustus* REIBISCH, Isis, 1892, p. 17, t. i, fig. 7. ? *B. ustulatus* Reibisch, Isis, 1892, p. 16, t. i, fig. 5,=*nux* var.?

This species is notable for the yellowness of its paler parts and the bright sienna brown of its darker portions. It is closely related to *B. calvus* Sby., which is a smaller, narrower shell. The form figured by Reeve (pl. 16, fig. 52) and by Reibisch (pl. 16, fig. 51) under this name is somewhat larger than the true *ustulatus*, and is considered by Dr. Stearns to be a banded variety of *B. nux*, but this is very doubtful. Pl. 16, fig. 49 is a copy of Sowerby's original figure. Pl. 23, fig. 16 is an enlarged view of a more streaked form.

B. venustus Reibisch (pl. 16, fig. 50) does not seem to offer any differential characters, and is placed here by Dall.

B. CALVUS (Sowerby). Pl. 22, figs. 2, 3, 4, 5.

Shell rimate umbilicate, oblong-turrited, solid; chestnut with few darker, obliquely longitudinal bands. Surface somewhat shining,

somewhat wrinkled longitudinally, with decussating spiral striæ on the spire, absent below. Spire slightly attenuated above, the apex obtuse, 1¾ earlier whorls costellate, the rest convex, last whorl rounded at the periphery.

Aperture contained about 2½ times in alt. of shell, oval; peristome thickened.

Alt. 12½, diam. 6, alt. of aperture 5 mill.

Alt. 13⅓, diam. 6, alt. of aperture 4¾ mill.

Alt. 14, diam. 6, alt. of aperture 5½ mill. (*Pfr.*).

James Island (Cuming); *Charles Island* (U. S. Fish Commission, Cuming and Wolf); *Chatham Island* (Kellett).

Bulinus calvus Sby., P. Z. S., 1833, p. 72 (James Island); Conch. Ill., p. 6, fig. 41, 1833.—*Bulimus calvus* Desh. in Lam. An. s. Vert. ed. ii, vol. viii, p. 179, 1838.—Pfr., Mon. Hel. Viv., II, p. 225, 1848; Chemn. Conch. Cab., ed. ii, *Bulimus*, t. 62, figs. 37, 38.—*Buliminus calvus* Beck, Ind. Moll., p. 70, 1838.—*Bulimulus* (*Omphalostyla*) *clavus* H. & A. Ad., Gen. Rec. Moll. II, p. 161, 1855.—*Bulimus calvus* Reeve, Conch. Icon., pl. xx, fig. 126, 1848.—*Bulimulus* (*Nesiotes*) *calvus* Martens in Albers, ed. ii, p. 221, 1860.—*Bulimulus* (*Nœsiotus*) *calvus* Pfr., Nom. Hel. Viv., p. 254, 1881.—Reibisch, Isis, 1892, p. 18, t. i, fig. 8.—Stearns, Proc. U. S. Nat. Mus., xvi, p. 427, 1893, *ex parte*.—Dall, Proc. Acad. N. S. Phila., 1896, p. 433.

Smoother than *B. ustulatus*, with less variegated coloration. "It is closely related to *B. ustulatus* and is rather nearly approached by certain dwarfish, unusually smooth specimens of *B. rugulosus*. *B. nucula* Pfr. is also closely allied."

B. nucula (Pfeiffer). Pl. 22, fig. 6.

Shell narrowly umbilicated, ovate-conic, rather solid, very subtly rugulose-striate; brownish-corneous, generally with a single pale girdle. Spire convex-conic, acute. Whorls 6½, a trifle convex, the last a little shorter than the spire, slightly compressed at base.

Aperture little oblique, somewhat semi-oval, angular at base; peristome simple, unexpanded, the right margin very arcuate above, columellar margin reflexed, spreading. Columella straightened, obliquely subtruncate at the base. Alt. 11½, diam. 6, alt. of aperture 5½ mill. (*Pfr.*).

Charles Island (Wolf); *Chatham Island near the S.-W. end* at a height of 1,600 feet (Baur).

Bulimus nucula PFR., P. Z. S., 1852, p. 60 (Gal. Is.); Mon. Hel. Viv., III, p. 415, 1853; IV, p. 475, 1859.—*Bulimus* (*Nœsiotus*) *nucula* PFR., Mal. Blatt. II, p. 161, 1854.—*Bulimulus* (*Omphalostyla*) *nucula* H. & A. AD., Gen. Rec. Moll., II, p. 161, 1855.—*Bulimulus* (*Nesiotes*) *nucula* MARTENS, in Albers Heliceen, ed. ii, p. 221, 1860.—*Bulimulus* (*Nœsiotus*) *nucula* PFR., Nom. Hel. Viv., p. 254, 1881.—REIBISCH, Isis, 1892, p. 15, t. i, fig. 2.—DALL, Proc. Acad. N. S. Phila., 1896, p. 433.—*Bulimulus* (*Nœsiotus*) *nux* var. STEARNS, Proc. U. S. Nat. Mus., xvi, pp. 380, 426, 1893.

"A specimen collected by Dr. Baur, submitted to Mr. Edgar A. Smith of the British Museum, was said to be somewhat darker colored and more coarsely striated than the type of *nucula* in that collection. These are, however, trivial differences under the circumstances. It agrees closely with a specimen sent by Reibisch under the name of *nucula*. It is a smoother, smaller and more compact shell than *rugulosus*, and shows a somewhat attenuated and dark colored apex, resembling that of *galapaganus* Pfr. It is, perhaps, most closely related to *B. ustulatus* or *B. calvus* Sby., and a sufficient series might very likely connect them." (*Dall*).

The figure is drawn from a specimen received from Dall, no. 107-469, U. S. Nat. Mus.

B. GALAPAGANUS (Pfeiffer). Pl. 22, fig. 7.

Shell compressed-umbilicate, ovate turrited thin, striatulate, silky, pellucid, corneous-waxen. Spire convexly turrited, rather acute; suture somewhat marginated. Whorls 8, the last about one-third the length of shell, compressed around the umbilicus.

Aperture subvertical, oblong-oval; peristome simple, the right margin arcuate above, a trifle expanded, forming an angle with the columella, which is somewhat twisted within. Alt. 15½, diam. 6, length of aperture 5⅔ mill. (*Pfr.*).

Charles Island, at about 200 ft. elevation, near the northeast end of the island (Dr. Baur).

Bulimus galapaganus PFR., P. Z. S., 1854, p. 58. Mon. Hel. Viv, IV, p. 503, 1859.—*Buliminus* (*Nœsiotus*) *galapaganus* PFR., Mal. Blatt., II, Vers., p. 160, 1854.—*Bulimulus* (*Nesiotes*) *galapaganus* MARTENS, in Albers Heliceen, ed. ii, p. 221, 1860.—*Bulimulus* (*Nœsiotus*) *galapaganus* PFR., Nom. Hel. Viv., p. 1881.—REIBISCH, Isis, 1892, p. 20.—STEARNS, Proc. U. S. Nat. Mus., XVI, p. 427, 1893.—DALL, Proc. A. N. S. Phila., 1896, p. 435.

The specimen illustrated, collected by Dr. Baur (U. S. Nat. Mus. no. 107291) differs from Pfeiffer's description in being rather solid and not pellucid. It is yellowish-brown with some dark oblique streaks and a faint light peripheral girdle, the earlier 5 whorls blackish-purple, gradually fading below. The columella is strongly truncate below. Alt. 14·8, diam. 5·8, length of aperture 4·8 mill. It is perhaps closest to *B. calvus* Sowb. Dall writes: "This is very closely related to *B. ustulatus* Sby., is slightly longer and more pupiform, and wants the bright yellowish bands. The whorls are more rounded in *B. galapaganus* than in *B. perspectivus*, and the latter is darker and more uniformly colored."

B. ESCHARIFERUS (Sowerby). Pl. 22, figs. 8, 9.

Shell rimate-perforate, oblong-pyramidal, rather thin; brown, a little darker on each side of a light peripheral girdle which ascends the spire just above the suture, and with a narrow light line below the suture. Surface shining, with indistinct wrinkle-striæ, a little puckered under the sutures, with faint spirals in fresh shells. Spire slender, its lateral outlines a trifle convex, slightly attenuated near the obtuse apex. Nepionic whorls 2¼, costellate. Whorls 7½–8, the earlier convex, the rest less so, last whorl oblong.

Aperture small, about a third the shell's length, purple-brown and showing the band inside; outer lip a trifle expanded, whitish; columellar lip dilated. Columella obliquely truncated below.

Alt. 16, diam. 6, alt. of aperture 5·3 mill.

Alt. 15·7, diam. 6·3, alt. of aperture 5·5 mill.

Alt. 18, diam. 6·5, alt. of aperture 6 mill. (*Pfr.*).

Chatham Island (Darwin, Kellett, U. S. Fish Commission and Dr. Baur), under stones near the shore at Wreck Bay and elsewhere; *Charles Island* (H. M. S. Peterel).

Bulinus escharifera SBY., Conch. Ill., figs. 85 (a, b), 1833.—*Bulimus escharifera* PFR., Symb., II, p. 45; Mon. Hel. Viv., II, p. 115, 1848.—SMITH, P. Z. S., 1877, p. 72.—*Bulimulus* (*Næsiotus*) *escharifera* PFR., Nom. Hel. Viv., p. 254, 1881.—REIBISCH, Isis, 1892, p. 14.—STEARNS, Proc. U. S. Nat. Mus., xvi, pp. 381, 426, 1893.—DALL, Proc. A. N. S., Phila., 1896, p. 434.—*Bulimus rugulosus* REEVE (not Sby.), Conch. Icon., pl. xx, fig. 123, 1848 (citation, diagnosis and figure refer to *escharifera*).—*Bulimulus* (*Omphalostyla*) *escharifera* H. & A. AD., Gen. Rec. Moll., II, p. 161, 1855.—*Bulimulus escharifera* ANCEY, Bull. Soc. Mal. France, IV,

p. 295, 1887.—*B. eschariferus* var. *bizonalis* ANCEY, op. cit., p. 295, 1887.—*B. eschariferus* var. *subconoidalis* ANCEY, op. cit., p. 295, 1887.

This species is lighter colored than *B. perspectivus* Pfr., with narrow umbilical perforation, although often rather broadly excavated behind the columellar lip, and the body-whorl does not hang sack-like below. Dall writes: "Though this species, as usually received, is apparently smooth and polished, it has minute more or less granular spirals, which it is probable in the young state bear hairs."

Var. *pileatus* Dall.

"Among the living specimens obtained at Chatham Island by the U. S. Fish Commission were some rather smaller than the average and covered with a dense brown epidermis, which bears numerous spiral lines more or less minutely granulose, a small hair or process of the epidermis projecting from each granule, giving the shell a pilose appearance. These specimens measure about 12 mm. in length and 5 mm. in diameter, the color of the shell is browner than in the type, and, when denuded of the periostracum, the shell is seen to be marked by numerous fine sharp, almost microscopic spirals. It may, perhaps, form a variety *pileatus*, of the typical *eschariferus*." (*Dall*).

Var. *ventrosus* Reibisch. Pl. 22, figs. 14, 15.

Shell widely rimate, oblong-oval, thin, shining, arcuately striate, marked with slender granulose spiral lines; pale yellowish with an encircling paler band; spire rather acute, suture plicose-margined; whorls $6\frac{2}{3}$–$7\frac{1}{2}$, convex, the embryonal ribbed, last two inflated; columella nearly straight. Aperture oblique, protracted, oval, glossy inside; peristome simple, the ends joined by a thin callus, right margin rounded, expanded, columellar margin reflexed, spreading. (*Reibisch*).

Alt. 17·5, diam. 8·3, length of aperture 7·5 mill.

Alt. 16·8, diam. 7·3, length of aperture 6·6 mill.

Barrington Island, common (Wolf, fide Reibisch, also Dr. G. Baur, who found it under stones near the shore).

Bulimulus (*Næsiotus*) *ventrosus* REIBISCH, Isis, 1892, p. 19, t. 1, fig. 12 a–b.—*Bulimulus* (*Næsiotus*) *eschariferus* var. *ventrosus* Reibisch, —DALL, Proc. A. N. S., Phila., 1896, p. 434, pl. 17, f. 3 (dentition).

"A specimen of this form was sent to Mr. Smith at the British Museum, and by him compared with the type of *B. eschariferus* with which he identified it. In color, form and range of variation the Barrington Island shells agree perfectly with those from Chatham and Charles Island (*eschariferus*), but the latter are always a little more slender if the specimens I have seen can be taken as a criterion. Twenty-four of them averaged 16 mm. long by 5 mm. in diameter above the aperture, while the diameter of the most slender of forty-two Barrington Island specimens was 6 mm. The latter have the spire less attenuated and slightly more compact. On the whole, it is doubtful if this form can rank higher than as a local race of *eschariferus*." (*Dall*).

B. PERSPECTIVUS (Pfeiffer). Pl. 22, figs. 10, 11, 12; pl. 24, figs. 35, 36.

Shell with a narrow but very deep and well-like umbilicus, oblong-turrited; reddish-brown becoming paler on the spire, and sometimes with a narrow, pale peripheral girdle; glossy, with faint arcuate growth-wrinkles. Spire with slightly convex lateral outlines and obtuse apex; whorls 7, the earlier 1¾ costulate, all whorls convex, the last rather sack-like and full below, excavated behind the columellar lip. Aperture ovate, dark purple-brown inside, somewhat oblique, slightly exceeding one-third the shell's length; peristome narrowly expanded throughout, and, with the broadly expanded columella, of a brown color. Columella either simply concave or conspicuously obliquely truncate below.

Alt. 16·5, diam. 6·3; length of aperture 6·2 mill.

Alt. 17, diam. 7; length of aperture 6·5 mill.

Alt. 16, diam. 6·5; length of aperture 6·5 mill. (*Pfr.*).

Chatham Island, Galapagos, 300–600 ft. alt., on rocks and under stones (Wolf).

Bulimus perspectivus PFR., P. Z. S., 1846, p. 33; Mon. Hel. Viv, ii, p. 97, 1848.—REEVE, Conch. Icon., *Bulimus*, pl. 63, fig. 435.—*Bulimulus* (*Ataxus*) *perspectivus* PFR. CLESSIN, Nomencl. Hel. Viv, p. 253, 1881.—*Bulimulus* (*Nœsiotus*) *rugulosus* REIBISCH, Isis, 1892, p. 19, t. i, figs. 11 a–b.—*Bulimulus* (*Nœsiotus*) *perspectivus* Pfr., DALL, Proc. A. N. S. Phila., 1896, p. 435.

The species resembles *B. eschariferus* in form, but it is of a deep reddish, instead of an olivaceous brown, the last whorl is more swollen basally and the umbilicus is larger and penetrates well-like

to the apex. Out of seven specimens before me, four show a narrow, pale band on the last whorl, another has it faintly traced, while on two it is absent. The lip is dark colored. Three of the specimens have the base of the pillar very prominent, almost channelled, the others are quite normal. The shell is midway between the typical *eschariferus* and the var. *ventrosus* in size. One specimen before me is but 11·6 mill. long, 5·5 wide, with hardly 6 whorls, although the lip proclaims it an adult. Such dwarfs occur in other species of this group. The first reference of it to *B. rugulosus* by Herr Reibisch was undoubtedly an error, which that gentleman detected upon examining the specimens in the British Museum.

B. JACOBI (Sowerby). Pl. 22, fig. 13.

Shell small, ovate-conic, narrowly umbilicate, thin : brown, with a peripheral pale girdle, sometimes bordered with darker above and below. Surface dull, wrinkle-striate, with numerous, fine, unequal, granose spiral striæ, every fifth or sixth being larger. Spire conic, the apex obtuse, nepionic 1¾ whorls costellate. Whorls about 6, convex, the last rounded.

Aperture short-oval, slightly oblique, contained about 2½ times in alt. of shell ; peristome thin, hardly expanded, everywhere arcuate ; columellar margin expanded ; columella concave.

Alt. 10½, diam. 5⅔, length of aperture 4 mill.

Alt. 10½, diam. 6⅔, length of aperture 5 mill. (*Pfr.*).

James Island (Cuming) ; *Charles Island* (Cuming) ; *1,600 ft. near Wreck Bay, Chatham Island*, on the under side of leaves of plants (var. *pallidus*), and on *East Albemarle Island* (Dr. Baur) ; *Albemarle Island, 200–800 ft.* on bushes and stones (Wolf, fide Reibisch) (var. *pallidus*) ; *Chatham Island*, 900–2,000 ft., in damp places and on the trunks of trees (var. *acutus*) (Wolf).

Bulinus jacobi SBY., P. Z. S., 1833, p. 74 (James Id.) Conch. Ill., p. 7, figs. 45, 45 (2 vars.) 1833.—*Bulimus jacobi* DESH. in Lam. An. s. Vert., ed. ii, vol. viii, p. 281, 1838.—PFR., Mon. Hel. Viv. II, p. 98, 1848 (not of Reeve, Conch. Icon., pl. xxi, fig. 135, 1848=*B. olla.* —*Buliminus jacobi* BECK, Ind. Moll., p. 70, 1838.—*Bulimulus* (*Omphalostyla*) *jacobi* H. & A. ADS., Gen. Rec. Moll., ii, p. 161, 1855.—*Bulimus* (*Nœsiotus*) *jacobi* ALBERS, Helic., p. 162, 1850.—*Bulimulus* (*Nesiotes*) *jacobi* MARTENS, in Albers, ed. ii, p. 221, 1860—*Bulimulus* (*Nœsiotus*) *jacobi* PFR., Nom. Hel. Viv, p. 254, 1881.—REIBISCH, Isis, 1892, p. 18.—DALL, Proc. A. N. S. Phila., 1896, p. 436. Not *B.*

jacobi STEARNS, Proc. U. S. Nat. Mus., XVI, p. 381, 1893—*Bulimulus* (*Næsiotus*) *pallidus* REIBISCH, Isis, 1892, p. 18, t. i, fig. 9.—*Bulimulus* (*Næsiotus*) *acutus* REIB., op. cit., p. 20, t. i, fig. 13, 1892.—? *Buliminus avellana* BECK, Index, p. 70.

"The typical *B. jacobi*, sent by Cuming to Dr. Lea in 1838, is a small, stout shell, with rather inflated whorls, covered with fine granulations, minute, obliquely transverse broken wrinkles, and fine granular spirals, hardly visible without magnification. The shell is pale reddish-brown, sometimes with a narrow, pale peripheral band. The pillar and body are without fold or tubercular callus. Those collected by Dr. Baur on Charles Island are the smallest I have seen which can be positively referred to this species. The larger, smooth form figured by Reeve under this name is distinct, and will be found referred to under the name of *B. olla*" (*Dall*).

Var. *pallidus* Reibisch. Pl. 23, fig. 20.

Differs from the typical form in being slightly smaller and more slender without the wrinkles, and it is probable that a large series would show no dividing line between the variety and the type.

Var. *acutus* Reibisch. Pl. 23, fig. 21.

Differs from *pallidus* in the almost entire absence of the spiral granulated sculpture, leaving much of the surface polished and smooth, except for incremental lines. Reibisch's figure shows one whorl more in the same length than the specimen he was kind enough to send me for examination, but slight differences of this kind are common among these very variable forms. It also comes very close to some varieties of *B. nucula* and *B. amastroides*, the latter being slightly smaller and more spindle-shaped (*Dall*).

Var. *cinereus* Reibisch. Pl. 23, fig. 17.

Shell with five and a half sharply granulated, wrinkled whorls; suture deep, aperture small, simple, thin-edged; umbilicus perforate, rather large but not funicular. Alt. 8, diam. 5·5, alt. of last whorl 6·0 mill. (*Dall*).

James Island at James Bay (Dr. Baur and Wolf).

Bulimulus (*Næsiotus*) *cinereus* REIBISCH, Isis, 1892, p. 19, t. i, fig. 10.—*Bulimulus jacobi* var. *vermiculatus* DALL, Nautilus, VII, p. 53, Sept., 1893.—*Bulimulus jacobi* var. *cinereus* Reib., DALL, Proc. A. N. S. Phila., 1896, p. 437, pl. 16, f. 14.

No living specimens of this species appear to have been collected. This variety is hardly separable from the smaller *B. jacobi*, though the dead and the fresh shells appear quite dissimilar. It is somewhat smaller than the smallest undoubted *jacobi*, and the granular sculpture is more dense and uniform. I have not seen any specimens with a spire as long and pointed as in Reibisch's figure. A specimen sent by him agrees in every way with those collected by Dr. Baur.

Resembles a dwarf *B. jacobi* with very sharp, beaded, alternate granulations in spiral rows; transverse wrinkles small but distinct; the spire pointed but the apex rather blunt.

B. OLLA Dall. Pl. 23, figs. 18, 19.

Shell umbilicate, ovate-conic, thin, light brown with a faint, hardly noticeable paler peripheral zone; somewhat shining; nearly smooth, but showing under the lens faint growth-lines and traces of a few spirals composed of oblong granules. Spire conic, the apex obtuse. Whorls about 7, convex, the last rounded.

Aperture ovate, slightly oblique; peristome thin, unexpanded, columellar margin dilated; columella slightly concave, a trifle truncate below.

Alt. 14, diam. 8, alt. of aperture 6 mill.

James Island (Cuming); *Duncan Island*, all dead, but fresh (Dr. Baur); *Barrington Island*, dead (Dr. Baur); *Conway Bay, Indefatigable Island* (Dr. Baur).

Bulimus jacobi REEVE, Conch. Icon., *Bulimus*, pl. xxi, fig. 135, 1848.—*Bulimulus olla* DALL, Nautilus, VII, p. 53, September, 1893. —*Bulimulus* (*Nœsiotus*) *olla* DALL, Proc. A. N. S. Phila., 1896, p. 437, pl. 16, f. 2.

"This shell is closely related to *B. jacobi*, and was figured by Reeve under that name. *B. olla* is larger, and wants the granulations of *B. jacobi*, its surface is nearly smooth and almost polished, marked with faint incremental lines, has seven whorls (against six in the other species) and a very bulbous pillar. The present species inhabits the grassy upper zone, while *B. jacobi* is found in the wooded area" (*Dall*).

B. TANNERI Dall. Pl. 23, fig. 25.

Shell short, stout, pointed, with two nepionic and four subsequent whorls; nucleus rather coarsely transversely ribbed, the interspaces somewhat wider; the subsequent whorls marked by incremental

lines and obsolete traces of fine, partly granulose, inconstant spiral threads, only perceptible under a lens; color pinkish or brownish-white with no traces of a peripheral paler band; whorls somewhat inflated, suture conspicuous, umbilicus large and deeply pervious; aperture large with a widely expanded lip, the outer lip much bent over at the body, closely approaching the pillar and united to it by a distinct callus. Length 11, max. diameter 7·0 mill. (*Dall*).

Indefatigable Island, U. S. Fish Commission.

Bulimulus (*Nœsiotus*) *Fanneri* DALL, Nautilus, VIII, p. 127, March, 1895, typ. err. for *Tanneri*, corrected in the index, p. iii, April, 1895.—*Bulimulus* (*Nœsiotus*) *Tanneri* DALL, Proc. Acad. N. S. Phila., 1896, p. 438, pl. 16, fig. 5.

"This is about the size of *B. cinereus* Reib., but is more conical, inflated and stouter, with a very differently shaped aperture, the lip being more expanded and reflected than in any other species yet described from these islands. It is named in honor of Capt. Z. L. Tanner, U. S. N., commanding the U. S. S. Albatross during the Galapagos explorations. None of the specimens were living" (*Dall*).

B. DUNCANUS Dall. Pl. 23, fig. 24.

The shell is short, stout, inflated, thin, with two nepionic and four-and-a-half subsequent whorls. The apex is rather pointed, the axial dimple small, the whorls rapidly enlarging, with the suture behind the last whorl deeper than the rest and more oblique to the axis; the aperture is relatively small and rather oblique, the lip simple, sharp, not reflected, connected across the body with a thin callus, a single tubercle on the body, well within the aperture, and about equidistant from either lip; umbilicus perforate, narrow. Height of the shell 18, of the last whorl 12·5; diameter of shell 11 mill. (*Dall*).

Duncan Island, dead specimens only (Dr. Baur).

Bulimulus (*Nœsiotus*) *duncanus* DALL, Nautilus, VII, p. 52, September, 1893; Proc. Acad. Nat. Sci., Phila., 1896, p. 438, pl. 16, f. 7.

"The sculpture comprises only incremental lines and faint wrinkles in harmony with them, especially just in front of the suture and near the end of the last whorl. When perfectly fresh there were probably microscopic granules spirally arranged and sparsely distributed, but these are now represented only by minute spots of

erosion. Except the largest specimens of *B. nux*, these shells are the largest *Bulimuli* described from the islands. They are, however, thinner than any specimen of *B. nux*, in this respect resembling *B. unifasciatus* Sby." (*Dall*).

B. DARWINI (Pfeiffer). Pl. 23, fig. 26.

Shell deeply rimate, ovate-conic, rather solid, strongly sculptured with wavy and crispate wrinkles; dull whitish. Spire conic, rather acute, corneous. Whorls 6, convex, the upper three smooth, the last about as long as the spire.

Aperture wide, suboval, rather shining inside, white, with a callous tubercle deep within on the parietal wall; peristome simple, straight; right margin arcuate above, columellar margin much dilated, spreading. Columella somewhat twisted, subvertical. (*Pfr.*)

Alt. 17, diam. 9, length of aperture 8½ mill.

Galapagos Is. (Darwin); *Bindloe I.* (Habel).

Bulimus Darwini PFR., P.Z.S., 1846, p. 29. Mon. Hel. Viv, ii, p. 199, 1848.—REEVE, Conch. Icon., pl. xxi, fig. 136, 1848.—*Bulimulus* (*Omphalostyla*) *Darwini* H. & A. AD., Gen. Rec. Moll., II, p. 161, 1855.—WIMMER, Sitzb. Akad. Wiss. Wien, lxxx, p. 44, 1879—*Bulimulus* (*Nesiotes*) *Darwini* MARTENS, in Albers, Heliceen, ed. ii, p. 220, 1860.—*Bulimulus* (*Næsiotus*) *Darwini* PFR., Mon. Hel. Viv, p. 254, 1881.—REIBISCH, Isis, 1892, p. 22.—STEARNS, Proc. U. S. Nat. Mus., XVI, p. 427, 1893.—DALL, Proc. A. N. S. Phila., 1896, p. 439. —*Bulimus manini* "Pfr." CARPENTER, Rep. Brit. Assoc., 1856, p. 359.—STEARNS, Proc. U. S. Nat. Mus., XVI, pp. 405, 427, 1893 (Err. typ.).

"The type specimen of this species has disappeared from the Cumingian Collection, and I have been unable to obtain a specimen for examination. The only reference to the particular island upon which it lives is derived from Habel" (*Dall*).

B. WOLFI Reibisch. Pl. 23, figs. 22, 23.

Shell inflated-ovate, perforate or umbilicate, solid, somewhat shining, buff, arcuately streaked, towards the aperture nodose-plicate, with a pale, narrow band. Spire wide, rather acute, suture rather deep. Whorls 7, sculptured with very delicate spiral lines, the last separated by a deeper suture, somewhat furrowed at the position of the peripheral band, and tuberculately plicate on each side of it. Nucleus delicately striated.

Aperture oblique, pentagonal, three-toothed; the terminations of the thick lip connected by a strong white callus; outer lip sinuous, forming an angle with the columellar lip; columellar tooth at the end of the fold; parietal tooth deeper within, the third tooth at the end of the peripheral furrow on the outer lip. Alt. 13, diam. 8, length of aperture 6 mill. (*Reibisch*).

Indefatigable Island (Wolf, fide Reibisch).

Bulimulus (*Nœsiotus*) *Wolfi* REIBISCH, Isis, 1892, p. 22, t. 2, figs. 1 a–b.—STEARNS, *op. cit.*, pp. 414, 427, 1893.—DALL, Proc. A. N. S., Phila., 1896, p. 439.

"A specimen of this species kindly forwarded for examination by Herr Reibisch is clearly distinct from anything I have seen. It resembles *B. Simrothi* Reib., but is more robust, the surface of the upper whorls smoother and more regular in sculpture, the pillar-tooth is more prominent and stronger, the parietal tooth, apparently normal, is not found in any *Simrothi* I have seen, the umbilicus is larger than in the latter species. It resembles Reeve's figure of *B. Darwini* somewhat, but the latter is 17 mill. long, while *B. Wolfi* only reaches a length of 13·5 mill. (*Dall*).

B. UNIFASCIATUS (Sowerby). Pl. 23, fig. 27; pl. 18, figs. 45, 46, 47.

Shell ovate-subpyramidal, thin, pellucid; brown with one whitish band. Whorls 5–6, ventricose, longitudinally striated, shining. Aperture elliptical, acuminate above; lip thin. Umbilicus small. Alt. 0·8, diam. 0·45 inch (*Sowb.*).

James Island, under lava (Cuming in Lea Collection); *Chatham Island, near the southwest end*, at a height of about 1,600 feet (Dr. Baur); *Chatham Island* (Kellett); *Charles Island* (Cuming and H. M. S. Peterel).

Bulinus unifasciatus SBY., P. Z. S., 1833, p. 37 (Charles Id.); Conch. Ill., fig. 55, 1833.—*Bulimus unifasciatus* DESH. in Lam. An. s. Vert., Ed. ii, vol. viii, p. 277, 1838.—REEVE, Conch. Icon., xxiii, fig. 149 (bad) 1848.—PFR., Mon. Hel. Viv, II, p. 195, 1848.—SMITH, P. Z. S., 1877, p. 72.—*Bulimulus unifasciatus* BECK, Index, p. 67, 1838.—*Bulimulus* (*Omphalostyla*) *unifasciatus* H. & A. ADS., Gen. Rec. Moll., II, p. 161, 1855.—*Bulimulus* (*Nesiotes*) *unifasciatus* MARTENS, in Albers, ed. ii, p. 220, 1860.—*Bulimulus* (*Nœsiotus*) *unifasciatus* PFR., Nom. Hel. Viv, p. 254, 1881; STEARNS, Proc. U. S. Nat. Mus., XVI, p. 427, 1893—DALL, Proc. A. N. S. Phila.,

1896, p. 439, pl. 17, f. 6, 11 (teeth and jaw).—*Bulimulus unifasciatus* REIBISCH, Isis, 1892, p. 15, syn.; but not p. 32, pl. i, fig. 1(=*nux* var.).

"In its thin and ample shell, uniform reddish-brown color, and narrow, well-defined peripheral pale band, this form resembles the species of the mainland more than any other Galapagos species. The transverse riblets on the nepionic shell are very fine and almost always decorticated [as in fig. 47; but even when perfect they are confined to the crown of the whorl]; the granular spirals are almost microscopic, and when fresh and perfect, bear small projections of the periostracum" (*Dall*). Fig. 46 is an enlarged view of the sculpture of the last whorl.

B. SIMROTHI Reibisch. Pl. 23, figs. 28, 29, 30.

Shell umbilicate, ovate-conic, solid; brown above, becoming very pale on the body-whorl, where two faint, narrow, darker bands define a light peripheral line. Surface lusterless, obliquely striate and with fine, indistinct spirals above, becoming very coarsely and deeply wrinkled and pitted on the body-whorl, which is feebly grooved at the position of the peripheral line. Whorls nearly 6½, convex, the last flattened laterally.

Aperture pentagonal-oval, brownish inside, peristome white, thickened within, the thickening often irregularly calloused, edged by a smooth band outside. Columella calloused in the middle.

Alt. 11·5, diam. 6·6, alt. of aperture 5 mill.

La Tortuga, grassy zone, *South Albemarle* (Baur); 1,000–2,000 feet, in the moist region, *Albemarle Island* (Wolf).

Bulimulus (*Næsiotes*) *Simrothi* REIBISCH, Isis, 1892, p. 23, t. 2, fig. 2.—STEARNS, Proc. U. S. Nat. Mus., XVI, pp. 414, 428, 1893.—DALL, Proc. Acad. N. S. Phila., 1896, p. 441, pl. 16, f. 11, 12, 13; pl. 17, f. 2 (jaw).—*Bulimulus* (*Næsiotus*) *tortuganus* DALL, Nautilus, VII, p. 54, 1893.

"Herr Reibisch has kindly furnished a photograph of one of his types of *B. simrothi* with which I have compared my specimens of *tortuganus*. Wolf's shell in the photograph appears smoother, without the deeply indented markings, and exhibits color streaks in harmony with the lines of growth which none of the specimens of *tortuganus* do. Nevertheless, the two forms should probably be united, especially as Reibisch's description agrees better than the photograph as respects surface and color. As the specimens col-

lected by Wolf were more or less immature, the original diagnosis needs some additional data.

"I have figured several specimens to show the variations of form and sculpture. When mature the shell always has a pretty solidly thickened peristome. The young are more translucent and show projecting points of epidermis along the minute granular spiral lines, as in *B. unifasciatus*, and like that species show a distinct peripheral paler band" (*Dall*).

B. BAURI Dall. Pl. 23, fig. 31.

Shell small, short, stout, with a dark, rapidly attenuated spire, distinct suture, and opaque yellow-brown last whorl; whorls about seven, the earlier ones dark livid purple with straw colored streaks, paler at the suture, rude, wrinkled and malleated; last whorl inflated, more or less wrinkled transversely, somewhat shining; umbilicus closed or a mere chink.

Aperture subquadrate, angulated behind and at the base of the pillar; pillar short, oblique; lips simple, thick, especially across the body where the callus has a raised edge; throat white. Length of shell 10, of aperture 4·5; diam. of shell 6·5 mill.

Hibernating on the under side of leaves of plants at the *southwest end of Chatham Island*, 1,600 feet above the sea (Dr. Baur).

Bulimulus (*Nœsiotus*) *Bauri* DALL, Nautilus, VII, p. 54, September, 1893; Proc. A. N. S. P., 1896, p. 441, pl. 15, f. 12; pl. 17, f. 7, 15 (jaw and teeth).

"This is a very distinct little species, with a pale yellow-brown body whorl darkening toward the tip of the spire, with conspicuous, lighter transverse wrinkles on the upper whorls, and fine ribbing on the nepionic shell which is of a livid purple, almost black. In specimens which have survived hibernation, the aperture is usually produced, contracted and conspicuously thickened. Many specimens have a narrow, pale line in front of the suture. There is no spiral sculpture" (*Dall*).

The columella suddenly widens as it enters the throat, with a suggestion of the sort of fold seen in *B. canaliferus*.

B. AMASTROIDES Ancey. Pl. 23, fig. 32.

Shell small, oblong, subperforate, rather thin; light olive colored, with a paler peripheral girdle bordered above and below by rather wide but very ill-defined brown bands. Surface glossy with growth

wrinkles, but no spiral striæ. Spire convex-conic, the apex obtuse, two nepionic whorls very finely, densely costulate. Whorls about 6½, slightly convex.

Aperture irregularly ovate, acuminate above, contained about 2⅓ times in length of the shell; peristome simple, thin; columellar margin triangularly dilated, white.

Alt. 10, diam. 5, length of aperture 4.25 mill.

Chatham Island (U. S. Fish Commission).

Bulimulus (*Nesiotus*) *amastroides* Ancey, Bull. Soc. Mal. de France, IV, p. 293, 1887.—Dall, Proc. A. N. S. Phila., 1896, p. 441, pl. 15, f. 16.—*Bulimulus jacobi* Stearns, Proc. U. S. Nat. Mus., XVI, pp. 381, 426, 1893, not of Sby.—*Bulimulus calvus* var. ? Stearns, *op. cit.*, p. 427.

"The shell has an olivaceous tint which distinguishes it at once from the mostly reddish or yellowish-brown species of which the fauna contains so many. This is the smooth form of which the plicate aspect is *B. curtus* of Reibisch and *Anceyi* of Dall" (*Dall*).

B. curtus Reibisch. Pl. 23, fig. 33.

Shell resembles *B. amastroides* Ancey, but with more plicate surface, ruder aspect, smaller mouth and more angular periphery. Alt. 9, diam. 4·5 mill. (*Dall*).

Chatham Island, near Wreck Bay, at a height of 1,600 feet (Baur); usually on the under surface of the leaves of plants. Also reported from Chatham by Wolf (Reibisch) in grassy places and on the trunks of trees, at from 900 to 2,000 feet, and by the U. S. Fish Commission.

Bulimulus (*Nœsiotus*) *curtus* Reibisch, Isis, 1892, p. 21, t. i, fig. 14. —Dall, Proc. A. N. S. Phila., 1896, p. 442, pl. 15, f. 13; pl. 17, f. 8. —*Bulimulus* (*Nœsiotus*) *amastroides* Ancey, var. *Anceyi* Dall, Nautilus, VII, p. 53, September, 1893.

"This is very closely related to *B. amastroides* Ancey, of which it is probably an offshoot. It has, in general, a more plicate surface, ruder aspect, smaller mouth, and more angular periphery. Specimens submitted by Herr Reibisch as representing his *curtus* agree exactly with the types of my variety *Anceyi*" (*Dall*).

B. canaliferus Reibisch. Pl. 23, figs. 34, 35.

Shell long-conic, fusiform, perforate throughout to the nucleus, thin, very glossy, delicately arcuate-striate; buff or corneous

brown, encircled by two wide brown bands; spire acute, suture linear. Whorls 8½ to 10, flat, regularly increasing, base compressed, nucleus smooth, brown. Aperture oblique, compressed laterally, narrow, hatchet shaped; peristome simple, the margins joined by a shining callus, right margin angularly adnate above, basal margin forming an angle with the somewhat thickened columellar margin; a channeled columellar fold winds around the axis (*Reibisch*).

Alt. 10, diam. 4·25, alt. of aperture 3·5 mill.

Alt. 8, diam. 3·75, alt. of aperture 3 mill.

Chatham Island, in moss and on ferns, 900–2,000 feet (Wolf, fide Reibisch).

Bulimulus (*Pelecostoma*) *canaliferus* Reibisch, Isis, 1892, p. 25, t. ii, fig. 6; Stearns, Proc. U. S. Nat. Mus., XVI, pp. 415, 428, 1893. —*Bulimulus* (*Næsiotus*) *canaliferus* Reibisch, Dall, Proc. A. N. S. Phila., 1896, p. 442, pl. 15, f. 14.

"This is a peculiar shell, characterized by its many-whorled spire, short aperture, and a large umbilicus with its walls deeply excavated, so that the groove shows as a prominent ridge on the pillar within the aperture. In the specimen sent by Herr Reibisch the edge of the aperture is hardly thickened and not at all reflected, there is a thin callus deposit over the body, but no trace of a parietal tooth. The species, with a totally different surface, has somewhat the form of *B. rugiferus*, but with a less slender and shorter spire. Reibisch's figure gives the impression of a more slender shell than the specimen I have examined" (*Dall*).

B. sculpturatus (Pfeiffer). Pl. 24, fig. 41.

Shell perforate, ovate-turrited, rather thin; longitudinally rather remotely and strongly wave-wrinkled, the intervals of the wrinkles sharply striated spirally; brownish. Spire long-conic, the apex rather acute, corneous. Whorls 7, convex, the last about two-fifths the total length.

Aperture elliptical, angular at base; peristome simple, acute, the columellar margin vaulted, reflexed, free. Columella straightened, extending to the base of the aperture. Alt. 14, diam. 6½ mill.; length of aperture 6½ mill. (*Pfr.*).

Galapagos Is. (Darwin).

Bulimus sculpturatus Pfr., P. Z. S., 1846, p. 29 (Gal. Is.); Mon. Hel. Viv., II, p. 183, 1848; IV, p. 476, 1859.—*Bulimus* (*Næsiotus*) *sculpturatus* Pfr., Mal. Blat. ii Vers., p. 161, 1854.—*Bulimus sculp-*

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turatus REEVE, Conch. Icon., pl. xx, fig. 125, 1848.—*Bulimulus* (*Omphalostyla*) *sculpturatus* H. & A. ADS., Gen. Rec. Moll., ii, p. 161, 1855.—*Bulimulus* (*Nesiotes*) *sculpturatus* MARTENS, in Albers, Heliceen, Ed. ii, p. 220, 1860.—*Bulimulus* (*Nœsiotus*) *sculpturatus* PFR., Nom. Hel. Viv., p. 254, 1881.—REIBISCH, Isis, p. 22, 1892.—STEARNS, Proc. U. S. Nat. Mus., xvi, p. 427, 1893.—DALL, Proc. A. N. S. Phila., 1896, p. 443.

"The particular island to which this species, collected by Darwin. belongs, is not known. I have not been able to obtain a specimen for examination. Reeve's figure recalls a specimen of *B. Simrothi* in which the lip has not yet been developed fully, but if his measurement is correct, the shell should be a little larger as well as more slender than in *B. Simrothi*." (*Dall*).

B. RUGIFERUS (Sowerby). Pl. 24, fig. 37.

Shell perforate, turrited, long and slender, dull brown; surface lusterless. Whorls 7½–9, the apex obtuse, earlier 1¾ whorls densely and finely longitudinally costulate, following two whorls with low wrinkles and fine spiral striæ, the remaining whorls very coarsely corrugated, most of the wrinkles interrupted, branching or anastomosing, the whole covered with sharp, thread-like spiral striæ.

Aperture irregularly oval, brown inside; peristome thin, simple, the columellar margin dilated; columella weakly truncated obliquely at base.

Alt. 10·5, diam. 3·7, length of aperture 3 mill.

Alt. 11, diam. 4, length of aperture 3·2 mill.

Alt. 12·5, diam. 3·75, length of aperture 3·5 mill.

James Island (Cuming).

Bulimus rugiferus SBY., P. Z. S., 1833, p. 36 (James Id.); Conch. Ill., fig. 40, 1833.—*Cochlicellus rugifer* BECK, Index, p. 63, no. 11, 1838.—*Bulimus rugiferus* DESH. in Lam. An. s. Vert., ed. ii, vol. viii, p. 276, 1838.—PFR., Mon. Hel. Viv., ii, p. 115, 1848.—REEVE, Conch. Icon., xx, fig. 118, 1848.—*Bulimulus* (*Omphalostyla*) *rugiferus* H. &. A. AD., Gen. Rec. Moll., ii. p. 161, 1855.—*Bulimulus* (*Nesiotes*) *rugiferus* MARTENS, in Albers, ed. ii, p. 220, 1860.—*Bulimulus* (*Nœsiotus*) *rugiferus* PFR., Nom. Hel. Viv, p. 254, 1881.—REIBISCH, Isis, 1892, p. 21.—STEARNS, Proc. U. S. Nat. Mus., xvi, p. 427, 1893.—DALL, Proc. Acad. N. S. Phila., 1896, p. 443.

This species is more slender than *B. nesioticus*, less so than *B. reibischi*, and with coarser sculpture.

B. NESIOTICUS Dall. Pl. 24, fig. 38.

Shell small, thin, pale brown, with two nepionic and five subsequent whorls; spire slender, suture distinct, umbilicus small or obsolete, apex rather blunt with an axial dimple, nepionic whorls transversely ribbed with fine, even regular riblets with about equal interspaces; the next whorl is sculptured with fine spirals, close set, under which are fine transverse wrinkles; the subsequent whorls show a more or less variable transverse ribbing, in which the ribs have a tendency to break up and vary in direction; these are crossed by fine, often granulose spirals, which are swollen where they cross the riblets; aperture small, throat yellowish, the pillar white, widely reflected without any terminal plait or callus, outer lip thickened, somewhat expanded, continuous with the pillar and a slight callus on the body. Length 12, breadth 5 mill. (*Dall*).

James Island (U. S. Fish Commission).

Bulimulus (*Nœsiotus*) *nesioticus* DALL, Proc. Acad. Nat. Sci. Phila., 1896, p. 443, pl. 16, f. 1.

"This interesting species was obtained on James Island in small numbers, one specimen fresh but none living, the one figured has rather sparser ribbing than the best preserved specimen. Most of them are bleached white. The shell appears to be intermediate in character and size between *B. sculpturatus* as figured, and *B. rugiferus* Sby. It was first referred to the latter species, but further study showed *B. nesioticus* to have two whorls less in the same length and to be a perceptibly stouter shell." (*Dall*).

B. REIBISCHI Dall. Pl. 24, fig. 42.

Shell elevated, slender, with nine whorls of a pale ferruginous color and rather solid consistency; sculpture like that of *B. nesioticus* but rather more closely ribbed; the suture distinct, somewhat appressed, whorls little inflated but not flattened; umbilicus a mere chink; aperture oval, higher than wide, rounded in front, the pillar simple, the margins thickened but not reflected; length 11, diameter 2·5 mill. (*Dall*).

Indefatigable Island, two specimens (U. S. Fish Commission).

Bulimulus (*Nœsiotus*) *reibischi* DALL, Nautilus, viii, p. 126, March, 1895; Proc. Acad. N. S. Phila., 1896, p. 444, pl. 16, f. 4.

"This shell, though shorter, is intermediate between such forms as *B. chemnitzioides* and the more normal *Nœsioti*. It is named in

honor of Herr Paul Reibisch, of Dresden, who recently worked up the land shells collected by Wolf in these islands, in a paper to which I have made frequent reference." (*Dall*).

BULIMULUS new species. Pl. 24, fig. 49.

Shell of about nine whorls, small, slender, with flattish sides, almost cylindrical, transversely finely wrinkled, suture distinct; aperture small, the outer lip sharp, the pillar lip short, broadly reflected, without plait or projecting callus; length 11·5, breadth 2·5 mill.

One specimen found on *James* and two on *Indefatigable Island* (Reibisch *in litt.*).

Bulimulus new species DALL, Proc. A. N. S. Phila., 1896, p. 444, pl. 15, f. 15.

The above description and figure are taken from a photograph kindly submitted to me by Herr Reibisch. I refrain from naming the species as the last mentioned gentleman had over two years ago announced his intention of describing it, but has so far, I believe, published nothing referring to it. As a distinct form from any previously reported from these islands, I have thought best to briefly indicate it. (*Dall*).

B. HABELI Stearns. Pl. 24, fig. 40.

Shell slender, elongated, thin, smooth and shiny, slightly umbilicated, with thirteen to fourteen gradually increasing whorls; whorls slightly convex and longitudinally obtusely plicated; suture distinct; aperture ovate and slightly reflected at the base of the columella. Color ashen white, slightly rufous, with hints of a narrow reddish band beneath the surface glaze. Dimensions (of largest example): Long 17·5 mill., diameter 3·5 mill. (*Stearns*).

Chatham Island (Habel, U. S. Fish Commission Steamer Albatross and Dr. G. Baur) under stones near the shore, at the southwest end of the island (typical form); *Chatham Island*, under stones and on mossy rocks in the moist region, 900–2,000 feet above the sea (Wolf fide Reibisch, *B. terebra*).

Bulimulus (*Pleuropyrgus*) *habeli* (Stearns MS.) DALL, Nautilus, Jan., 1892, p. 99; STEARNS, Nautilus, Dec., 1892, p. 86; Proc. U. S. Nat. Mus., xvi, pp. 382, 428, pl. 51, f. 1, 1893.—*Bulimulus* (*Naesiotus*) *habeli* Stearns, DALL, Proc. A. N. S. Phila., 1896, p. 445.—

Bulimulus (*Pleuropyrgus*) *terebra* REIBISCH, Isis, (Oct.) 1892, p. 24, t. ii, fig. 3.

"This form is much more slender than *P. chemnitzioides* Fbs., which is well represented by the figures 6a, 6b, plate 9, Proc. Zool. Soc. London, 1850. Aside from the differences in color and sculpture, the surface of Forbes' species is dull in fresh, unrubbed, perfect specimens; the ribs in the latter species are comparatively sharp, thread-like, regular, and somewhat distant, the interspaces being perceptibly wider than the ribs are thick." (*Stearns*).

"The specimen of *B. terebra* (pl. 24, fig. 39) submitted by Herr Reibisch is slightly larger, more dull colored and has a more evident umbilicus than the typical specimens of *Habeli* which were obtained in a more unfavorable station, but the differences do not appear to be sufficient to be worthy of a specific name, at least judging from material I have been able to study. No specimens of *B. Habeli* containing the soft parts have been received by me. The nepionic whorls are usually decorticated and smooth, but when perfect show extremely fine transverse ribbing. In the single specimen I have seen of the variety *terebra* Reibisch, the nepionic ribbing is coarser and more evident." (*Dall*).

B. CHEMNITZIOIDES (Forbes). Pl. 24, figs. 44–48.

Shell subrimate, turrited, thin but rather solid, purple-brown with a yellow band under the suture and another at the periphery, or corneous-yellow with a chestnut band, the base also chestnut. Sculpture of rather strong vertical riblets separated by intervals of sometimes the same, sometimes greater width, with slight traces of spiral striation above. Whorls 12–15, convex, the last rounded at the periphery.

Aperture irregularly ovate, its length contained about 4½ times in that of the shell; peristome thin, the outer lip unexpanded, slightly bent forward in the middle, columellar lip short, triangularly and flatly dilated above; columella straight, not truncated at base.

Alt. 19, diam. 4, length of aperture 4 mill. (*Pfr.*).

Alt. 13·5, diam. 3·7, length of aperture 3·8 mill.

Chatham Island, at 300–600 feet elevation, with *B. perspectivus* Pfr., on rocks and under stones (Wolf), on the leaves of plants at 1600 feet elevation, *near the southwest end of Chatham Island* (Dr. Baur; also Kellett, Habel and the U. S. Fish Commission).

Bulimus chemnitzioides Fbs., P. Z. S., 1850, p. 55, pl. ix, fig. 6.—Pfr., Mon. Hel. Viv., iii, p. 303, 1853; Chemn., Conch. Cab., ed. ii, *Bulimus* no. 113, pl. 31, figs. 21–23.—*Bulimus* (*Nœsiotus*) *chemnitzioides* Pfr., Malak. Blatt., p. 160, 1855.—*Bulimulus* (*Omphalostyla*) *chemnitzioides* H. & A. Ads., Gen. Rec. Moll., ii, p. 161, 1855.—*Bulimulus* (*Pleuropyrgus*) *chemnitzioides* Martens in Albers Heliceen, ed. ii, p. 221, 1860.—Pfr., Nom. Hel. Viv., p. 254. 1881.—Reibisch, Isis, 1892, p. 24, t. ii, fig. 4.—Stearns, Proc. U. S. Nat. Mus., xvi, p. 381, 1893.—*Bulimulus* (*Pleuropyrgus*) *lima* Reibisch, Isis, 1892, p. 25, t. ii, fig. 5.—*Bulimulus* (*Nœsiotus*) *chemnitzioides* Fbs., Dall, Proc. A. N. S. Phila., 1896, p. 445, pl. 17, f. 4 (dentition).

"The younger specimens named *lima* by Reibisch (pl. 24, fig. 43) though apparently differing somewhat in form, appear to grade directly into the others. This species sometimes shows a small but distinct parietal tooth or callosity, but this is quite exceptional." (*Dall*).

Buliminus lyelliae Beck, Index Moll., p. 70, from the "I. Gallappagos," is a nude name. Beck places it between *B. calvus* and *B. jacobi*.

Subgenus Orthotomium Crosse & Fischer, 1874.

Orthotomium C. & F., Moll. Terr. et Fluv. Mex., i, p. 473, 1874, type *B. sufflatus*.—Pilsbry, Nautilus, ix, p. 114, 1896.—Dall, Proc. U. S. Nat. Mus., xix, p. 357, 1897.

+ *Globulinus* C. & F., l. c., p. 475, type *B. sufflatus; Mormus* Binney & Tryon, not Albers; *Peronœus*, *Scutalus*, *Thaumastus*, *Mesembrinus* of authors, not Albers.

Shell umbilicate or rimate, varying from ovate-globose to cylindrical or pillar-shaped; *never with spiral color-markings;* with the initial 1½ to 2 whorls sculptured with vertical riblets, the interspaces often minutely striate spirally; a decided apical dimple or pit.

Distribution: Central and northern Mexico, southwestern U. S. and Lower California.

Distinguished from *Nœsiotus* and *Protoglyptus* by geographic distribution and the general aspect of the shell, rather than by any definable differences. In other words, while the group is a natural one, comprising specific forms of undoubtedly common ancestry, it

has not diverged in any important particular from that common stock of which *Nœsiotus*, *Protoglyptus* and *Orthotomium* are the modern and now geographically individualized remnants. Among the minor distinctions between these groups may be mentioned the coloration; *Orthotomium* never having spiral bands, such as occur occasionally in *Nœsiotus* and *Protoglyptus*, and commonly in typical *Bulimulus*.

The species of *Orthotomium* (as here limited) have been widely scattered throughout the complex maze of Bulimuloid subgenera by all authors up to a very recent date. In 1893 Dall reduced the chaos of Lower Californian subgenera to partial order; early in 1896 the writer, recognizing the cardinal value of apical sculpture, outlined the system herein adopted; and in a later work Dall demonstrates the essential unity underlying the widely diverse contours of the adult shells.

Three "sections" then, may conveniently be recognized; although the differences, it will readily be understood, have no great significance.

I. Columella bearing a strong callous lamina within the last whorl, Section *Sonorina*, p. 155.

II. No callous lamina upon the columella.

1. Shell ovate or oblong; aperture much over a third the shell's length, generally one-half or more, Section *Orthotomium* s. s., p. 126.
2. Shell subcylindrical; aperture less than one-third the length of shell, Section *Plicolumna*, p. 151.

Section *Orthotomium* (C. & F.) Pils.

This section comprises two groups of species, those of central and eastern Mexico, Texas, etc., and those of Lower California. In the latter group the shell is frequently striated spirally and granular; it is never so in the eastern group.

Key to groups.

I. Lip not expanded or hardly so, often thickened within; no spiral striation.

a. Ovate-conic or oblong forms of central and northeastern Mexico and southcentral and southwestern United States, *Group of B. alternatus*, p. 127.

a'. Ovate-globose or oval species of Lower California, *Group of B. sufflatus*, p. 135.

a''. Oblong species of Lower California,
Group of inscendens, p. 148.

II. Lip expanded, surface generally granulate,
Group of B. montezuma, p. 141.

Group of B. alternatus.

Thaumastus of authors, not of Albers (see Vol. x, p. 43).—*Rhabdotus* (in part) ALBERS, Die Hel., 1850, p. 164, not *Rabdota* Dej., 1833.

A group of few species, of which *B. dealbatus* and its varieties and *B. alternatus* are excessively variable, prolific in individuals and widely distributed. *B. durangoanus* is known by only one specimen, and *B. nigromontanus* by several in very poor condition. The latter, if less removed geographically, would from the material as yet collected, be judged a variety of *dealbatus;* but it lies far to the west of the known range of *dealbatus* and *alternatus*, and may show more distinctive features when good specimens come to light.

The group as a whole differs from most of the Lower Californian forms in lacking spiral sculpture. It closely resembles the Chilian section *Lissoacme* (Vol. x, p. 154), but differs in apical sculpture.

B. DURANGOANUS Martens. Pl. 18, figs. 32, 33.

Shell perforate, rather lengthened, irregularly striatulate, somewhat shining; white, with scattered dots and little streaks of diaphanous-gray. Whorls 6, the first and second subglobose, vertically costulate, pale brownish, the following a little convex with rather impressed suture, last moderately attenuated below. Aperture less than half the shell's length, a little oblique, ovate, acute above; peristome simple, the outer margin straight, thin, arcuate, basal margin arcuate, columellar margin dilated above and a little reflexed. Alt. 15, diam. 6; aperture, length 6½, width 4 mill. (*Martens*).

Villa Lerdo, State of Durango, northern Mexico (Höge).

Bulimulus (*Peroncæus*) *durangoanus* MART., Biol. Centrali Americana, Moll., p. 246, pl. 16, f. 11, 11a.

A small and slender member of the group of *dealbatus, ragsdalei* and *mooreanus*, with the translucent gray dots and streaks of many specimens of the latter, from which its reduced size, small mouth and slender figure will distinguish it. The resemblances to *B.*

gruneri Pfr. (=*Drymæus virgo* Lea !) and *B. artemisia* Binn. noticed by von Martens, are merely adventitious.

B. NIGROMONTANUS Dall.

Shell short, wide, white, with 5 whorls, rather rudely striated in harmony with the lines of growth, nuclear whorls 2, neatly, evenly sculptured with fine, usually wavy, minute ribs, the summit with a small central funicular dimple; whorls moderately rounded, the last much the largest, the spire obtusely conical; base full and rounded, with a rather large, deep and subcylindrical umbilicus; outer lip sharp, hardly reflected; pillar lip reflected rather widely near the body around (not over) the umbilicus; body with a thin wash of callus, the outer lip strongly incurved at its junction, giving a somewhat tubular look to the suture; substance of the shell thin, without markings. Length 18, of the last whorl 13, maximum diameter 11 mill. (*Dall*).

Summit of Black Mountain, Sonora, Mexico (Dr. Mearns).

Bulimulus (*alternatus var.?*) *nigromontanus* DALL, Proc. U. S. Nat. Mus., xix, p. 357.

The shells above described are not in the best condition, and I have some hesitation in describing them, but after an exhaustive comparison with the Bulimuli of the region and of Lower California I find none to which the present form can be confidently assigned. It recalls somewhat *B. xantusi* Binney, and *B. baileyi* Dall, but is smaller and more globose than either. In form some of the varieties of *B. alternatus* Say, come nearest to it, but have a different surface and marking, which are absent from the present form, and none of them has so deep and cylindrical an umbilicus. I have thought it best, therefore, to put it on record until the reception of more material shall enable a final decision to be made. (*Dall*).

B. DEALBATUS (Say). Pl. 17, fig. 1; pl. 18, figs. 27, 28, 29, 30, 48.

Shell umbilicate, ovate-conic, thin; corneous brown streaks which are slightly translucent alternating with opaque cream-white or light brown ragged streaks, either tint sometimes predominating. Sculpture of slight growth-wrinkles generally becoming stronger and more regular on the spire, the nepionic 1¾ whorls typically with subobsolete fine longitudinal riblets, almost smooth. Whorls about 6½, convex.

Aperture about half the shell's length, ovate, corneous and white inside, the peristome acute, unexpanded, generally slightly thickened, or with a rib within. Columellar margin dilated. Columella regularly concave. Alt. 20, diam. 11–12, alt. of aperture 10–11 mill.

Southwestern North Carolina; Henry and Lawrence Counties, Kentucky; west to Camden Co., central Missouri, and Shawnee Co., Kansas; southwest to Alabama and Corpus Christi, Eagle Pass and Pecos Co., Texas.

Helix dealbata Say, Journ. Acad. N. S. Phil., ii, p. 159; Binney's edition, p. 10.—*Bulimus dealbatus* Pot. et Mich., Galerie, i, p. 139, t. 13, f. 3, 4.—Phil., Abbild., i, p. 158, t. 2, f. 6.—Kuster, Conchyl. Cab., t. 16, f. 11–13.—Pfr., Monogr., ii, p. 187; Conchyl. Cab., p. 55. Reeve, Conch. Icon., f. 455.—Binney, Terr. Moll., p. 276, pl. 51, f. 1; pl. 51*a*, except upper and lower figures.—Leidy, Terr. Moll. i, p. 229, pl. xv, f. 1 (anatomy).—W. G. Binney, Terr. Moll., iv, p. 130, pl. 80, f. 6, 7; Land and Freshwater Sh. N. A., i, p. 208, f. 359.—*Bulimulus dealbatus* W. G. B., Terr. Moll., v, p. 393, f. 269 (jaw); pl. x, f. e (teeth), and Man. Amer. L. Sh., p. 401, f. 441. —Crosse & Fischer, Moll. Mex., i, p. 566.—Stearns, Proc. U. S. Nat. Mus., xiv, 1891, p. 97; xvi, 1893, p. 751.—Sampson, Nautilus, viii, p. 18.—Singley, Texas Moll., in Fourth Ann. Rep. Geol. Surv. Texas, p. 309.—Simpson, Proc. U. S. Nat. Mus., xi, 1888, 452.—*Scutalus dealbatus* Say, Tryon, Amer. Jour. Conch., iii, p. 173, pl. 14, f. 9.—*Buliminus dealbatus* Beck, Index, p. 72.—*Zebrina dealbata* Held in Isis, 1837, p. 917.—*Bulimus liquabilis* Reeve, Conch. Icon., f. 387, pl. 57.—*Bulimus confinis* Reeve, Conch. Icon., pl. 86, f. 643.

Figures 28 and 30 represent the typical forms of this species, as developed in the region from Tennessee and Alabama to Kansas and northern Texas. In the latter state the shell becomes larger (figs. 1, 19, from Waco) and often of stouter figure with larger mouth (figs. 27, 29, 48, Lee Co.), while retaining the texture. The apical whorls of these are more strongly ribbed.

Var. ragsdalei Pilsbry. Pl. 18, fig. 31.

Like typical *dealbatus* in contour or more slender. *Entire surface sculptured with sharp, thread-like, obliquely longitudinal striæ;* the striæ white, spaces gray or pinkish-gray.

Alt. 21, diam. 10·3, length of aperture 9·7 mill.

Alt. 20, diam. 11, length of aperture 9·5 mill.

Texas: on the Red River in Cook and Montague Counties (G. H. Ragsdale); *along the Rio Grande at Comstock* (Wm. Lloyd) *and Langtry* (V. Bailey), *Val Verde Co; Fort Clark, Kinney Co.* (Mearns).

Bulimulus ragsdalei PILS., Nautilus, iii, p. 122; v, p. 37, pl. 2, f. 3; Proc. Acad. Nat. Sci. Phila., 1890, pp. 64, 296, pl. 5, f. 3.—W. G. BINNEY, Fourth Supplement to Terr. Moll., v, in Bull. Mus. Comp. Zool., xxii, p. 191, pl. 2, f. 9 (not good).—*Bulimulus dealbatus var.* =*B. ragsdalei* STEARNS, Proc. U. S. Nat. Mus., xiv, 1891, p. 97.—*Bulimulus dealbatus ragsdalei* Pils., DALL, Proc. U. S. Nat. Mus. xix, p. 374.

Var. MOOREANUS ('W. G. B.' Pfeiffer). Pl. 25, fig. 55; pl. 17, figs. 2, 3, 4, 5.

Shell umbilicate, ovate-conic; *white above, coffee-with-cream colored below the periphery,* or with the basal tint absent; sometimes varied with waxen or dark gray streaks, and often showing scattered gray dots which are translucent by transmitted light. Surface smooth, under the lens showing more or less strongly developed *striæ on the spire;* apex waxen or dark. Alt. 25, diam. 12 mill., but varying much in proportions.

Texas, mainly from Fort Worth to De Witt and Uvalde Counties.

Bulimus schiedeanus var. W. G. BINNEY, Terr. Moll., iv, p. 129, pl. 80, f. 8.—*Bulimus mooreanus* "W. G. Binney" PFR., Monogr., vi, p. 143.—*Bulimulus schiedeanus* var. *mooreanus* W. G. B., L. &. F.-W. Sh. N. A., i, p. 205, f. 353–355; Terrestr. Moll., v, p. 392, f. 277–279; Man. Amer. L. Sh., Bull. U. S. Nat. Mus., No. 28, p. 400, f. 438–440.

This is the abundant form throughout central-southern Texas, particularly in the region about San Antonio. It lives in vast numbers in the mesquite chaparral, hibernating in the earth, æstivating upon the bushes, adhering to the bark. It is smaller, thinner and smoother than the typical *schiedeanus,* and more northern in distribution. The streaked specimens show all stages between *mooreanus* and *dealbatus,* and with a large geographic series it is easy to demonstrate the complete intergradation of the two.

This is the form commonly known as "*schiedeanus*" among American collectors.

Var. SCHIEDEANUS (Pfeiffer). Pl. 17, figs. 6 to 15.

Ovate-conic, often with the spire rather attenuated above, solid and strong, calcareous, white, rarely with ochreous streaks; roughly, irregularly striate, not much shining; spire as long as the aperture. Aperture varying from white to ochrey inside; peristome without an internal callous rim.

Alt. 31, diam. 17, alt. aperture 17 mill. (Pfr. type).

Alt. 34, diam. 18, alt. aperture 15½ mill. (Coahuila).

Alt. 30, diam. 15, aperture 14 mill. (western Texas).

Mexico (Dr. Schiede, original locality); *Tehuacan, State of Puebla* (F. C. Baker, Uhde and others); *Laguna de Chapala, Jalisco* (Deppe); *Villa Lerdo, Durango* (Höge), *States of Tamaulipas* (Binney) *and Coahuila* (W. H. Dougherty), *western Texas along the Rio Grande* (H. C. Wood).

Bulimus schiedeanus PFR., Symb. Hist. Hel., i, p. 43 (1841); in Philippi's Abbild. Neuer Conch., i, p. 56, *Bulimus*, pl. 1, f. 12; Monogr. Hel. Viv., ii, p. 187; in Martini & Chemnitz, Syst. Conch. Cab. ed. 2, *Bulimus*, p. 160, pl. 46, f. 3, 4.—REEVE, Conch. Icon. v, *Bulimus*, pl. 54, f. 361.—BINNEY, Terr. air-breath. Moll. of N. Am., iv, p. 129, pl. 80, f. 8 (var.), 15.—*Bulimus* (*Mesembrinus*) *schiedeanus* ALBERS, Die Hel., ed. 1, p. 157.—PFR. in Malak. Blätt., ii, p. 158 (1855).—*Orthalicus* (*Mesembrinus*) *schiedeanus* H. & A. ADAMS, Gen. Rec. Moll., ii, p. 157.—*Bulimulus* (*Thaumastus*) *schiedeanus* v. MART. in Albers Die Hel. ed. 2, p. 215.—FISCH. & CROSSE, Miss. Scient. Mex., Mollusca, i, p. 563, pl. 24, f. 2.—*Bulimulus* (*Scutalus*) *schiedeanus* v. MART. in Malak. Blätt., xii, p. 30 (1865).—*Thaumastus schiedeanus* TRYON, Am. Journ. Conch., iii, p. 172, pl. 10 (14), f. 1, 4 (1868).—*Bulimulus schiedeanus* BINNEY & BLAND, Land and Fresh-water Shells of N. Am., i, p. 204, f. 352; BINNEY, Terr. airbreath. Moll. of N. Am., V, (Bull. Mus. Comp. Zool., iv, p. 391), f. 276 (1878); Bull. Mus. Comp. Zool., v, p. 338, pl. 1, f. E (1879); Manual of Am. Land Shells, p. 399, fig. 437.—STREBEL, Beitr. Mex. Land-und Süssw. Conch., iv, pl. 6, f. 19; v, p. 57, pl. 11, f. 16, 17.—VON MARTENS, Biol. Centr. Amer., Moll., p. 239, pl. 15, f. 12–23.—*Bulimus niveus* HEGEWISCH, *in litt.*—*Bulimus candidissimus* NYST, *in litt.*—? *Bulimus xanthostomus* WIEGM. in Berlin Museum.

The typical *schiedeanus* ranges over the greater part of central, north-central and northeastern Mexico, and in the region immediately

north of the Rio Grande. It is abundant as far south as the State of Pueblo, where it was collected by the Mexican expedition from the Academy of Natural Sciences and by Uhde and Höge.

Typical *schiedeanus* does not occur in central southern Texas, being replaced there by *mooreanus*, a more glossy, generally thinner shell, smoother below and with regular striation on the spire.

A form of *schiedeanus* from along the Rio Grande below El Paso has oblique ochre-red stripes on the body-whorl (fig. 6). The spire is slender above, as in the large, pure white specimens from the State of Coahuila (figs. 14, 15). Figs. 7–13 represent Mexican specimens.

Var. PATRIARCHA (W. G. Binney). Pl. 17, fig. 16.

On the average larger than *schiedeanus*, with shorter, acuminate spire and more globose body-whorl. Solid and roughened, white; aperture ochre colored inside. Alt. 35, diam. 19, length of aperture 19 mill.

Northeastern Mexico at Buena Vista, State of Nuevo Leon (Berlandière); *Also in Texas* (W. G. Binney).

Bulimus patriarcha BINNEY, Proc. Acad. Phil., 1858, p. 116; Terr. air-breath. Moll. of N. Am., iv, p. 130, pl. 80, f. 13.—PFR., Monogr. Hel. Viv., vi, p. 143.—*Thaumastus patriarcha* TRYON, Am. Journ. Conch., iii, p. 171, pl. 9 (13), f. 15.—*Bulimulus patriarcha* BINNEY and BLAND, Land and Fresh-water Shells of N. Am., i, p. 200, f. 346; BINNEY, Terr. air-breath. Moll. of N. Am., v, p. 388, f. 270; Manual of Am. Land Shells, p. 396, f. 431.—*Bulimulus* (*Thaumastus*) *patriarcha* FISCH. & CROSSE, Miss. Scient. Mex., Mollusca, i, p. 564.—*Bulimulus schiedeanus* var. *patriarcha* MARTENS, Biol. Amer. Centr., Moll., p. 242.

This form seems quite distinct when compared with the so-called *B. schiedeanus* (=*mooreanus*) of central Texas, but its differences from the true *schiedeanus* of Mexico are only slight. Von Martens, with his usual excellent judgment, unites them.

B. ALTERNATUS (Say). Pl. 25, figs. 50–53; pl. 17, figs. 17, 18, 20, 12, 22–26.

Shell ovate oblong, umbilicate, solid and strong, nearly smooth; the whorls of the spire not regularly striated. White, varying to blue or pink tinted, or suffused with coffee-brown, and usually with scattered gray dots, or alternately white and gray or brown striped. Aperture oblong, very dark chestnut within, or sometimes ochrace-

ous; outer lip strongly thickened within, with a light border; columella more or less distinctly folded or even toothed above. Length about 30–35 mill.

Northeastern Mexico and southern Texas.

Bulimus alternatus SAY, New Harmony Disseminator, Dec., 1830, p. 25 (ed. Binney, p. 39).—PFR., Monogr. Hel. Viv., ii, p. 221.—BINNEY, Terr. air-breath. Moll. of N. Am., IV, p. 126, pl. 80, f. 1, 3 (copy of Say's drawing).—*Thaumastus alternatus* TRYON, Am. Journ. Conch., iii, p. 171, pl. 9 (13), fig. 6; pl. 10 (14), fig. 10.—*Bulimulus alternatus* BINNEY & BLAND, Land and Fresh-water Shells of N. Am., i, pp. 200–204, f. 347–350, 351 (radula); BINNEY, Terr. air-breath. Moll. of N. Am., v, pp. 388–391 (with the same figures repeated).—COCKERELL, Journ. de Conch., xxxix, p. 23 (1891).—STEARNS, in Proc. U. S. Nat. Mus., xiv, p. 99, (1891).—*Bulimulus* (*Thaumastus*) *alternatus* FISCH. & CROSSE, Miss. Scient. Mex., Mollusca, i, p. 561, pl. 24, f. 1 (copy of Say's original drawing).—BLAND & BINNEY, Am. Journ. Conch., vii, p. 181.—*Bulimus lactarius* (Menke), PFR., Symb. Hist. Hel., iii, p. 85 (1846); Monogr. Hel. Viv., ii, p. 187.—REEVE, Conch. Icon., v, *Bulimus*, pl. 37, f. 217*b*.—*Bulimus* (*Scutalus*) *mariæ* ALBERS, Die Helic. ed. 1, pp. 160, 162.—*Bulimus mariæ* PFR., Monogr. Hel. Viv., iii, p. 350; in Martini & Chemnitz, Syst. Conch. Cab., ed. 2, *Bulimus*, p. 157, pl. 48, f. 7, 8; P. Z. S., 1858, p. 23, pl. 40, f. 2.—*Bulimus* (*Ena*) *mariæ* PFR. in Mal. Blätt., xii, p. 154 (1855).—*Orthalicus* (*Scutalus*) *mariæ* H. & A. ADAMS, Gen. Rec. Moll., ii, p. 158.—*Bulimulus* (*Thaumastus*) *mariæ* v. MART., in Albers's Die Hel., ed. 2, p. 215.—*Thaumastus mariæ* TRYON, Am. Journ. Conch., iii, p. 172, pl. 10 (14), f. 3.—*Bulimus dealbatus var.*, BINNEY, Terr. air-breath. Moll. of N. Am., ii, p. 276, pl. 51, 51a (uppermost and lowest figures); pl. 51b (the three middle figures).—*Bulimulus* (*Rhabdotus*) *alternatus* MARTENS, Biol. Cent. Amer., Moll., p. 243, pl. 15, f. 24–26.—*Bulimus binneyanus* (Pfr., ms. label) BINNEY, Terr. Moll., iv, p. 128 (1859). Not *B. binneyanus* Pfr., Malak. Bl., iv, p. 229 (1857).—*Bulimus galeottii* NYST, *in litt.*—*Bulimulus alternatus* STEARNS, Proc. U. S. Nat. Mus., xiv, 1891, p. 99 (includes *schiedeanus*, *patriarcha*, *mariæ*, *mooreanus* as synonyms).

B. dealbatus var. *mooreanus* has regular striation upon the postnepionic whorls of the spire or some of them, lacking in *alternatus*. It is generally less oblong and thinner. *B. dealbatus* var. *schiedeanus* is rougher, with the aperture wider and shorter.

This species approaches very near certain forms of *B. dealbatus* var. *mooreanus* in some Texan localities, and is only with great difficulty to be distinguished from them. Indeed some conchologists of great experience with Texan Bulimuli regard *alternatus* as merely a variety of *dealbatus*. My reasons for retaining *B. alternatus* distinct, are that differences though inconspicuous actually exist; that throughout the range of *alternatus* it occurs with either *mooreanus* or *schiedeanus* without intergrading in the vast majority of localities, and that as ordinarily found, the species is conspicuously distinct. It should be added that this opinion is based upon the study of many hundreds of shells, and considerable field experience in Texas.

Typical ALTERNATUS, Pl. 25, figs. 50, 51, 52, 53.

As described by Mr. Say and represented by one of his types now before me, differs considerably from the ordinary form of the species. It is conic-ovate, not very thick, with 6 convex whorls separated by impressed sutures. Alternately ragged-striped with opaque white and blue-gray in dead shells, corneous-brown when living; aperture bluish-white inside (hence the "perlaceous tinge" of Say's description). Columella concave, with no noticeable fold.

Alt. 30½, diam. 18; length of aperture 16½ mill.

Mexico (Maclure).

The synonym *B. lactarius* apparently belongs to typical *alternatus*.

Var. MARIÆ (Albers). Pl. 17, figs. 17, 18, 20, 12, 22–26.

Ovate-oblong, *thick and solid, smooth,* with 6 to 7 moderately convex whorls; white or with brown streaks or ragged stripes; *aperture dark brown within* (rarely ochraceous); columella more or less distinctly *folded or toothed* above. Dimensions and proportions quite variable.

Alt. 27, diam. 15 mill. (average specimen).

Alt. 22½, diam. 14 mill. (short specimen).

Alt. 35½, diam. 17 mill. (long specimen).

Texas: two or three tiers of counties north of the Rio Grande, from Corpus Christi N.-W. to Frio and Val Verde Counties and southward. Northeastern Mexico, at Matamoras and south to Tampico, State of Tamaulipas.

B. binneyanus Pfr., *olim.* is the same; also "var. *albidus* Taylor," of Cockerell, which of course is utterly baseless. That the classification of varieties proposed by Mr. Cockerell (Journ. de Conchyl.,

1891, p. 23) is simply frivolous, will be apparent to anyone examining a good series of these shells.

Figures 17, 18 were drawn from specimens from Derby, Frio Co., Texas; f. 20, Hidalgo, Hidalgo Co.; f. 12, Corpus Christi, an exceptional form; f. 22–25, Laredo, Webb Co.

The limit of its range westward is not yet ascertained, either in Texas or Mexico; that assigned above being merely what is now known. The localities "Louisiana" and "Isthmus of Tehuantepec," quoted in some works, are erroneous. "*B. alternatus*" Forbes, P. Z. S., 1850, p. 54 "from Panama," is an error for *B. alternans*, a species of *Drymœus*.

Group of B. sufflatus.

The species of this group and those following are Lower Californian, with the exception of a few found upon the neighboring mainland. Of the latter, *B. excelsus* occurs at La Paz on the Peninsula, and in a distinguishable variety at Sinaloa (W. M. Gabb) on the mainland. The Costa Rica specimens referred to *B. pallidior*, prove to be decolored examples of a *Drymœus* apparently identical with *D. zhorquinensis* Angas. *B. baileyi* occurs at many localities in the State of Sonora, but its occurrence on the Peninsula is very doubtful. There is therefore but one species of *Bulimulus*, *B. excelsus*, which can be admitted on satisfactory evidence to inhabit both the Peninsula and the mainland; although *B. baileyi* is very closely allied to some peninsular species.

Most of the Lower Californian Bulimuli now known, inhabit the mountainous region lying southeast of a line connecting La Paz on the east coast with Todos Santos on the west; while in the elevated region above the twenty-sixth parallel of latitude the genera *Epiphragmophora*, *Berendtia* and *Cœlocentrum* are developed, largely to the exclusion of *Bulimuli*, although *Sonorina* extends into this tract.

The literature of Lower Californian Bulimuli has quite recently assumed extensive proportions, comprising several reports by J. G. Cooper on species collected by naturalists from the Californian Academy of Sciences, published in the Proceedings of that Academy, 1891 to 1895; a paper by Prof. Wm. H. Dall (Proc. U. S. Nat. Mus. 1893, 639) based upon material from the same source and Binney's types collected by Xantus de Vesey; a paper by Jules Mabille upon collections made by Diguet, introducing a large number of new and unfigured species, without comparisons with known forms; two brief

notes by the writer, defining the natural groups of Bulimuli and describing new forms, and finally a philosophic and well-considered essay by Dall (Proc. U. S. Nat. Mus., 1896) discussing a portion of the fauna.

B. SUFFLATUS (Gould). Pl. 18, figs. 38–44.

Shell broadly rimate-perforate, thin but solid, oval; white under a pale yellowish cuticle, with occasional narrow oblique yellow-olive streaks. Surface shining, with growth-wrinkles. Spire very short; whorls 5, convex, the first very finely costulate, the last large, oval, inflated.

Aperture ovate, acuminate above, broadly rounded below, white within; peristome thin and acute, not expanded; columellar margin broadly dilated above, white; columella concave, without fold.

Alt. 28, diam. 18, alt. of aperture 17½ mill.

Alt. 20, diam. 14, alt. of aperture 12 mill.

Alt. 36½, diam. 21 mill.

Lower California, from *San Jose del Cabo to La Paz* (Gabb, Bryant); *Sierra Laguna* to 3000 ft. alt. (Eisen); *El Taste Mts.*, 3200 ft. alt.; *El Chinché Mts.*, 2000 ft. alt. (var. *chinchensis*).

Bulimulus vesicalis GOULD, Journ. Bost. Soc. N. H., vi, p. 375, pl. 14, f. 1 (October, 1853).—PFR., Monogr., iv, p. 467.—CPR., P. Z. S. 1856, p. 203.—GABB, Amer. Journ. Conch., iii, p. 236, pl. 16, f. 6. Not *B. vesicalis* Pfr. (March, 1853), see p. 69.—*Bulimulus sufflatus* GOULD, in W. G. BINNEY, Terr. Moll., iv, p. 25; Proc. Acad. Nat. Sci. Phila., xi, 1859, p. 188.—GOULD, Otia Conch., p. 184.—PFR., Monogr., vi, p. 110.—CROSSE, Journ. de Conchyl., 1871, p. 207.—*Bulimulus* (*Mormus*) *sufflatus* BINN. & BLD., Land and Freshwater Sh. N. A., i, p. 206, f. 356.—COOPER, Proc. Cal. Acad. (2), iii, p. 102.—*Bulimulus sufflatus* BINN. & BLD., Amer. Journ. Conch., vi, p. 209, pl. 9, f. 8, 13 (jaw and teeth).—COOPER, l. c., pp. 208, 212, 340, pl. 14, f. 6 var. *insularis;* iv, p. 140, pl. 5, f. 9, 11, with var. *chinchensis*, f. 10.—MARTENS, Biol. Cent. Amer. Moll., p. 244.—*Bulimulus* (*Orthotomium, Globulinus*) *sufflatus* CROSSE & FISCHER, Moll. Terr. et Fluv. Mex, pp. 473, 475, 568, pl. 20, f. 23, 24, 25; pl. 19, *f.* 17, 18 (jaw and teeth).—*Mormus sufflatus* TRYON, Amer. Journ. Conch., iii, p. 172, pl. 14, f. 6.—*Bulimus juarezi* PFR., P. Z. S., 1865, p. 832; Novit. Conch., p. 280, pl. 69, f. 1, 2; Monogr., vi, p. 123.—*Bulimulus* (*Orthotomium*) *sufflatus* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 648, pl. 72, f. 9.—STEARNS, Proc. U. S. Nat.

Mus., xvii, 1894, p. 164.—*Bulimulus* (*Globulus*) *sufflatus* MABILLE, Bull. Soc. Philomath. de Paris, (8), vii, p. 69 (1895).

Var. *insularis* Cooper.

"Found only by Mr. Bryant on one point of Espiritu Santo Island, where he got six dead chalky specimens, apparently fossil though only seen on top of the ground. Compared to Gould's type they are not so swollen (while others we have are much more so), but they closely resemble some from toward La Paz in form, being more narrowly ovate, but smaller. A half-grown one is as thin as many of them closely resembling a large *B. pilula* from Point Arena, but the full-grown are thickened more than any of either form, the mouths of two having a heavy callous connecting the lips, and in one developing a blunt tooth on the inner wall. (This excessive thickening is also found in a var. of *Helix areolata* from the same island). The umbilicus is like that of *B. sufflatus* of same size, and also as in large *B. pilula*. It is 1·20 inch long, 0·70 wide, mouth 0.65 long, 0·50 wide, in most thickened specimens; no distinct expansion of lip, but its margin is thickened." (*Cooper*).

Var. *chinchensis* Cooper. Pl. 25, fig. 63.

"Approach nearer to *B. pilula*, and are evidently mature, with thickened lips." (*Cooper*).

El Chinche Mts., 2000 ft. alt.

B. RECOGNITUS J. Mabille.

Shell ovate-globose, rather thin, solid, covered-perforate; white under a thin, deciduous rufescent epidermis; coarsely and irregularly costulate-striate; apex subobtuse, regularly costulate, shining. Whorls 5, convex, regularly and rather rapidly increasing, separated by an impressed, obscurely crenulated suture; last whorl large, $\frac{3}{5}$ the alt. of the shell, globulose, inflated, at the base slightly attenuated, slowly descending in front. Aperture vertical, ovate, a little tapering and narrowed above; peristome simple, unexpanded, the margins joined by a thin, glossy callus; outer lip with a long, decided arch, basal curved, columellar shorter, emitting a thin, shining lamina, impressed at its origin and nearly closing the perforation. Columella nearly straight, a little thickened, slightly truncate at base. Alt. 27, greatest diam. 17 mill.; aperture with peristome 16 mill. long, 12 wide. (*Mabille*).

Lower California (Diguet).

Bulimulus (*Globulus*) *recognitus* MAB., Bull. Soc. Philom. (8), viii, p. 69.

B. PILULA (W. G. Binney). Pl. 25, fig. 57.

Shell globose, inflated, umbilicated; thin; with longitudinal wrinkles; chalk-colored; apex obtuse; whorls 4, convex, the last very inflated, equalling ten-elevenths the length of the whole shell; columella simple, arched; aperture oblique, rounded; peristome simple, acute, its columellar end expanded so as to partially cover the umbilicus. Length 22, breadth 7 mill.; aperture 9 mill. long, 6 wide. (*Binney*).

Lower California: Todos Santos Mission and Margarita Island (Xantus), the type from the former locality.

Bulimulus pilula W. G. B., Proc. Acad. Nat. Sci. Phila., 1861, p. 332, fig.—PFR., Monogr., vi, p. 126.—*Bulimulus* (*Mormus*) *pilula* BINN. & BLD., Land and Freshwater Shells of N. A., i, p. 206, f. 357.—*Bulimulus* (*Orthotomium?*) *pilula* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 646, pl. 72, f. 10. Not *Mormus pilula* Tryon, or *Bulimulus pilula* Crosse & Fischer and Cooper.

While stating that the original types of *B. pilula* are distinct from the form so-called by Crosse and Fischer, Dall has unfortunately neglected to point out what the differences are.

Xantus collected both the types and the form now called *cooperi*. One of the original lot collected by him, received through Binney, is shown in fig. 35 of pl. 18. Another specimen bleached perfectly white, also received from Binney, labelled Margarita Island, is shown in fig. 34 of the same plate. Binney made no distinction between the two forms, and as Tryon, Crosse and Fischer and Cooper all selected the "*cooperi*" form, which agrees well when bleached with Binney's description and first figure, it would have been better to restrict the species *pilula* to that form. Binney's measurements are of course wrong; perhaps the "Long. 22" was meant for 12; but even then the assigned diameter seems too small.

The figure is copied from Binney's engraving of 1869.

Dall writes: The types of this species in the National Museum have a distinct and mature appearance. The specimens connecting them with *sufflatus* are usually young *sufflatus*. The two types have 4 and 4½ whorls, respectively, as many as specimens of *sufflatus* four times their size. The nuclear whorls are smaller than in *sufflatus* and more delicately sculptured, while the incremental wrinkling on

the body whorl is more conspicuous and regular than in the larger species. I have seen no specimens of *pilula* which appear to be genuine except the types. All the others when critically studied resolve themselves into varieties of *sufflatus*.

B. COOPERI Dall. Pl. 18, figs. 34, 35, 36, 37.

Shell umbilicate, globose, inflated, thin; longitudinally obsoletely wrinkle-striate; whitish-calcareous with two chestnut bands; spire short, apex obtuse; suture impressed. Whorls 4, convex, the embryonic 1½ [delicately costulate], the last inflated, longer than the spire (in the proportion of 7 to 4). Aperture somewhat oblique, ovate-rounded, white inside; peristome simple, whitish, the terminations separated, columellar margin broadly dilated, reflexed, partly covering the umbilicus; basal and outer margins acute. Alt. 11, greatest diam. 8½, alt. of aperture 7 mill. (*Crosse & Fischer*).

Lower California: San Jose del Cabo (Bryant).

Mormus pilula TRYON, Amer. Journ. Conch., iii, p. 173, pl. 14, f. 7.—*Bulimulus pilula* CROSSE & FISCHER, Moll. Terr. Mex., i, p. 570, pl. 21, f. 6, 6a.—COOPER, Proc. Cal. Acad. Sci. 2d ser., iii, p. 102, 210; iv, p. 143, pl. 5, fig. 12, 1894. Not *Bulimus pilula* Binney as restricted by Dall.—*Bulimulus cooperi* DALL, Proc. U. S. Nat. Mus., 1895, p. 5.—COOPER, Proc. Cal. Acad., v, p. 163.—*Bulimulus* (*Orthotomium*) *cooperi* DALL, Proc. U. S. Nat. Mus., xix, p. 358.

"This form, distinguished among other things by pale peripheral banding, is quite distinct from the true *B. pilula* of which the types are in the National Museum." (*Dall*).

The longitudinal wrinkling is quite distinct, but there are no spiral lines or granulation.

B. DECIPIENS Cooper.

"I propose this name for a new form, of which three specimens were brought from San Lazaro Mt. They were living but apparently quite young, too immature to figure. The largest is nearly of the size and form of *B. pilula* as figured, but still more globular, being shorter and wider, with three whorls. It is more Heliciform, much resembling *H. californiensis*, young, and like that has a single vittiform band around the periphery, which becomes hidden in the suture of two upper whorls. The band is however, paler than the brownish epidermis (faded in alcohol). To prove their affinity to

the Bulimuli of the region, they show the vertical riblets on 1½ apical whorls, and a more sunken nucleus than in the *Helix*. No single-banded *Helix* is known for 200 miles north of the locality of this species." (*Cooper*).

Sierra San Lazaro, near Cape St. Lucas, Lower California (Eisen).

Bulimulus decipiens COOPER, Proc. Cal. Acad. Sci. (2), v, p. 164 (June, 1895).—*Bulimulus* (*Orthotomium*) *decipiens* DALL, Proc. U. S. Nat. Mus., xix, p. 358.

"A third species was among those referred at first to *B. pilula*, with some doubt, by Dr. Cooper in the series submitted to me. Unfortunately, the specimens, though living when obtained, are not adult. They appear, however, to represent a very distinct species. The shell is of pale, livid, pinkish-brown, with a peripheral, narrow, pale-yellow band. The largest specimen has a *Leptobyrsus* nucleus (not keeled) of 2 whorls, and about 2¼ rapidly enlarging later whorls.

The suture is distinct, but not deep, the shell, when adult, is probably about the shape of *sufflatus*, but thinner; the umbilicus is deep, but very small, and almost hidden by the reflection of the pillar lip; the base is rounded; the surface marked by inconspicuous incremental lines and by spiral, microscopic but sharp, distant, slightly elevated lines, between which are still finer spiral striations. The general surface is not polished even when perfectly fresh, but the wear on the fine elevated lines seems to polish them, so that under a strong triplet they shine against the duller background of the rest of the surface. This sculpture is very characteristic and quite unlike that of any other Lower Californian species. The shell above described measures 11·5 mill. high, of which the last whorl stands for 10 mill., and 9·5 mill. in diameter. It was collected by Eisen in the Sierra San Lazaro, near Cape St. Lucas, in September, 1894." (*Dall*).

B. LEVIS Dall. Pl. 19, fig. 64.

Shell thin, ovate-conic, narrowly umbilicate, white under a thin olivaceous-yellow cuticle. Surface somewhat shining, with somewhat irregular, low growth-wrinkles but no spiral striæ or granulation. Whorls 5½, convex, the last more inflated than in *B. xantusi*. Aperture ovate, the peristome simple, unexpanded. Columella straightened above, not folded; parietal callus thin.

Alt. 17, diam. 11·3, alt. of aperture 9 mill.

Alt. 18, diam. 10·5 mill.

Alt. 17, diam. 8·5 mill.

Lower California: Rancho Lagunas, Punta Arena, near sea level (Bryant); *Sierra Laguna, near La Chuperosa,* alt. 2000 ft. (Eisen).

Bulimulus xantusi var. levis DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 642.—COOPER, Proc. Cal. Acad. (2) iv, p. 139, pl. 5, f. 14. —*Bulimulus levis* DALL, Proc. U. S. Nat Mus., xviii, 1895, p. 5; xix, p. 359.—*Bulimulus xantusi* COOP., Proc. Cal. Acad. (2), iii, p. 213.

"This species is covered with a smooth, polished, greenish-yellow epidermis, with vertical darker streaks, instead of dark brown as in *B. xantusi*, and it is absolutely without granulation." (*Dall*).

Group of B. montezuma.

B. EXCELSUS (Gould). Pl. 20, figs. 69, 70, 71.

Shell large, oblong-conic, imperforate but with a conspicuous and deep reversed-sigmoid rimation; fleshy-brown with oblique pale streaks and whitish below the suture; the lusterless surface rather finely obliquely striated, striæ more or less distinctly cut into oblong granules. Spire long conic, the apex obtuse. Whorls 6½ to 7, the tip of the first turned in, with a terminal deep comma-shaped dimple, 2¼ nepionic whorls regularly rather delicately costulate; following whorls but weakly convex, the last straight or a trifle ascending in front, oblong.

Aperture about half the total length, ovate; peristome broadly expanded, flaring, somewhat reflexed below; columella dilated, with a rather conspicuous wide fold above (fig. 70).

Alt. 44, diam. 19 mill. (Gould's type).

Alt. 55, diam. 28, alt. of aperture 30 mill. (Sinaloa).

Alt. 55, diam. 27½ alt. of aperture 28 mill. (Sinaloa).

La Paz, Lower California (Xantus, Belding, Fisher); *Sinaloa State of Sinaloa* (W. M. Gabb).

Bulimus excelsus GOULD, Journ. Bost. Soc. N. H., vi, 1853, p. 376, pl. 14, f. 3; Otia Conch., p. 184.—W. G. BINNEY, Terrestr. Moll., iv, p. 24, pl. 79, f. 12.—PFEIFFER, Monogr. Hel. Viv., iv, p. 384.—*Thaumastus excelsus* TRYON, Amer. Journ. Conch., iii, p. 171, pl. 13, f. 10.—*Bulimulus* (*Mesembrinus*) *excelsus* BINNEY & BLAND, Land and Freshwater Sh. N. A., i, p. 196, f. 342.—COOPER, Proc. Cal. Acad. Sci., (2), iii, pp. 101, 209.—*Bulimulus* (*Scutalus*) *excelsus* CROSSE & FISCHER, Moll. Mex., i, p. 514.—*Bulimulus* (*Leptobyrsus*) *excelsus* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 643, pl. 72, f. 7. *Bulimus elatus* GLD., op. cit., p. 408, in expl. of plate.

Most nearly allied to *B. pallidior*, but larger with the whorls less convex, especially above.

Dall writes: "This is the largest, finest, and most local of the forms of this group, when fresh is streaked with waxen-white and purplish-brown and is whitish in front of the suture. It has two nuclear whorls obtusely keeled and with a less conspicuous apical pit than the others. The spiral striæ on the nucleus are often extremely faint, but can usually be made out with a magnifier on the later whorls, I have not seen any specimens where the striation was strong enough to granulate the wrinkles. While differing somewhat in form, the size is rather uniform compared with that of the other species as might be expected from its smaller range in area and altitude. The pillar bears an observable fold but no lamina."

Figure 71 represents Gould's type. The shells collected by Gabb at Sinaloa (figs. 69, 70) are decidedly larger, and show spiral series of fine long granules on the spire, subobsolete on the body whorl. This large form may be distinguished as var. *sinaloæ*.

B. PALLIDIOR (Sowerby). Pl. 19, figs. 49, 51, 53, 54, 55.

Shell oblong-turrited, very deeply rimate, the umbilical region excavated; white or cream-white; surface shining, faintly wrinkled by growth-striæ, and with subobsolete spiral series of oblong granules, often hardly visible. Spire slender, high-conic, the apex obtuse. Whorls 6½ to 7, convex, the nepionic costellate, the last whorl more convex at the shoulder; sutures impressed, generally accompanied by an impressed line below producing a narrow margin.

Aperture oblong, the peristome expanded, flaring below, broadly dilated and reflexed on the columellar margin. Columella concave below, straighter above, usually showing a deep-seated wide fold. Parietal callus light.

Alt. 37, diam. 19½, alt. of aperture 20½ mill.

Alt. 39, diam. 21½, alt. of aperture 20 mill.

Lower California, chiefly southern; San Jose del Cabo (Belding, Eisen); *Cape St. Lucas* (Xantus); *Punta Arena* (Bryant); *Carmen Island* (Stearns); *Santa Margarita Island* (U. S. Fish Commission).

Bulinus pallidior SOWB., P. Z. S., 1833, p. 72; Conch. Illustr., f. 39, 44.—*Bulimus pallidior* DESH. in Lam., An. s. Vert., viii, p. 280. —PFR., Monogr., ii, p. 61; vi, p. 40.—REEVE, Conch. Icon., pl. 55, f. 365.—W. G. BINN., Proc. Acad. N. S. Phila., 1861, p. 331.—*Bulimulus pallidior* BECK, Index, p. 66.—H. FISCHER, Journal de

Conchyl., 1895, p. 137, pl. 7, f. 6, 6a, 6b (living animal).—Cooper, Zoe, iii, p. 15 ; Proc. Cal. Acad. (2), iii, pp. 101, 208, 210.—*Bulimulus* (*Mesembrinus*) *pallidior* Binn. & Bld., L. and Fr. W. Sh. N. A., i, p. 195, f. 340, 341.—*Thaumastus pallidior* Tryon, Amer. Journ. Conch., iii, p. 170, pl. 13, f. 9.—*Bulimulus* (*Scutalus*) *pallidior* Crosse & Fischer, Moll. Mex., i, p. 512, pl. 20, f. 9.—Dall, Proc. U. S. Nat. Mus., xvi, 1893, p. 640, pl. 72, f. 2, 3.—Stearns, Proc. U. S. N. Mus., xvii, p. 164.—*Bulimus vegetus* Gld., Journ. Bost. Soc. N. H., vi, 1853, p. 375, pl. 14, f. 2 ; Otia Conch., p. 184. —Pfr., Monogr., iv, p. 397.—*Bulimulus* (*pallidior?*) *vegetus* Cooper, Proc. Cal. Acad. (2), iv, p. 133, pl. 5, f. 2, 3, with var. *vegexpiza*, p. 134, pl. 5, f. 1 ; pl. 6, f. 27.—*Mesembrinus pallidior* W. G. Binney, Ann. N. Y. Acad. Sci., iii, p. 122 (dentition).

The specimens reported from Costa Rica are a species of *Drymœus*, showing a remarkable resemblance to this *Bulimulus*.

Var. *striatulus* Dall. Pl. 19, figs. 50, 52, 68.

Surface finely but strongly granular from the persistence of spiral incised lines cutting close longitudinal wrinkles. Lip broadly reflexed and recurved throughout ; columellar fold conspicuous within.

Carmen and Margarita Islands ; Gulf coast of the Peninsula, and on the Sierra el Taste and Sierra Laguna.

Figure 52 represents Cooper's variety *vegexpiza*, which is identical.

B. acholus J. Mabille.

Shell nearly covered rimate-umbilicate, conic ovate, solid, rather thick, subopaque ; gray, covered with a caducious dull rufous cuticle and sparsely marked with pale brown streaks ; longitudinally striate, and everywhere with compressed scattered granules. Whorls 5, irregularly (the first moderately, the rest rapidly) increasing, convex, the last whorl much inflated, depressed toward the well impressed suture, attenuated at base, slightly descending at the aperture, nearly equalling a half of the shells length. Aperture ovate, rather ample, vertical ; peristome acute, slightly thickened, patulous, whitish ; margins approximating, the outer a little arcuate, columellar dilated over the umbilicus. Columella slightly oblique, arcuate. Length 46, greatest diam. 21 mill. ; aperture with peristome 27 mill. long, 18 wide. (*Mabille*).

Mountains of Lower California, in company with *B. montezuma*. (Diguet).

Bulimulus (*Scutalus*) *acholus* Mab., Bull. Soc. Philomath. de Paris, (8), viii, p. 68 (1895).

Compare *B. montezuma*, from which this seems to differ in having fewer whorls and narrower form; if, indeed the diameter assigned be correct.

B. cosmicus J. Mabille.

Shell covered rimate, ovate, apex attenuated; rather thick, a little opaque, white under a thin deciduous epidermis; rudely, irregularly striate, under the lens seen to be quite conspicuously ornamented with decurrent impressed lines and compressed granules; spire conoidal, little lengthened, apex minute, obtuse, closely costulate. Whorls 5, irregularly increasing, (the first moderately, the rest very rapidly); suture impressed, deeply separating the embryonic whorls and obscurely denticulated; the last whorl large, oblong-ovate, inflated, slightly attenuated at the base, obscurely descending in front.

Aperture vertical, long ovate, acute above; peristome patulously reflexed, thickened, the terminations joined by quite a distinct callus; columellar margin widely expanded, closing the rimation, joining the long arc of the outer lip in an obtuse, wide angle. Columella twisted, impressed in the middle, then arcuate. Alt. 48, greatest diam. 25 mill.; aperture with peristome 34 mill. long, 20 wide. (*Mabille*).

Sierras of the south of the Peninsula of Lower California (Diguet).

Bulmulus (*Scutalus*) *cosmicus* Mab., l. c., p. 68.

Certainly distinct from anything known in America, if Mabille's measurements are to be trusted.

B. montezuma Dall. Pl. 19, figs. 56, 57.

Shell large, ovate-conic, deeply rimate, moderately solid; whitish with rare livid streaks, or dull brown with occasional darker oblique streaks (no spiral color bands). Lusterless, densely and coarsely granose in spiral series. Whorls 6, the earlier 1¾ vertically costulate; moderately convex.

Aperture ovate; peristome broadly expanded outwardly and below; ends converging; columellar margin very broadly dilated above; columella with a convex fold above.

Alt. 46, diam. 24; alt. of aperture 26½ mill.

Alt. 48, diam. 26; alt. of aperture 28 mill.

Alt. 52½, diam. 28 mill.

Alt. 63, diam. 30 mill.

Lower California, mostly in the mountainous region; Sierra Laguna, 2000–3500 ft. alt. (Eisen and others); *El Taste Mts.*, down to 1000 ft. alt. (Eisen); *Rancho de San Bartolo* (Diguet).

Bulimus proteus W. G. BINNEY, Proc. Acad. Nat. Sci. Phila., 1861, p. 331.—*Bulimulus* (*Scutalus*) *proteus* BINN. & BLD., Land and Freshwater Sh. N. A., i, p. 207, f. 358.—COOPER, Proc. Cal. Acad. Sci. (2) iii, pp. 211, 208; Zoe, iii, p. 15.—*Bulimulus* (*Scutalus*) *montezuma* DALL, Nautilus, vii, p. 27; Proc. U. S. Nat. Mus. xvi, 1893, p. 640, pl. 82, f. 1.—COOPER, Proc. Acad. (2), iv, p. 136, pl. 6, f. 26.—MABILLE, Bull. Soc. Philomath. de Paris, (8), vii, p. 68 (1895).

"As Dr. Cooper observed, this species is not as "Protean" as some others. It exhibits no such variations in form or color as *B. proteus;* the latter assumes almost every mutation of form, but taken on the average is less acute and has the last whorl less patulously drawn out, axially, than the *B. montezuma.* The color of *B. proteus* is variably distributed, but tends in the most strongly colored examples to be laid on in 4–6 broad, spiral bands of brown, with indistinct boundaries, separated by paler zones. In *B. montezuma* the color is seldom present, but, when it is, it is laid on in narrow, obscure zones, parallel with the incremental lines and never spirally disposed. The granulation in the Californian shell is less coarse and intense than in the Peruvian species when most developed, and the umbilicus averages much smaller in the former. All these characters are of degree rather than kind, but two features may be mentioned which appear constant and specific. In the Mexican shell the angle which the outer lip makes with the body whorl, or axial perpendicular, at its junction is invariably more acute than in *B. proteus*, which latter has the lip bent suddenly down at this point. Secondly, the larval shell or nucleus of *B. proteus* is beautifully shagreened with minute punctations or short, almost vermicular, indentations, visible plainly under a glass, and only absent when worn off by abrasion. Traces of this sculpture may always be found. In *B. montezuma* the nucleus is delicately ribbed in harmony with the incremental lines, and does not show the peculiar shagreening alluded to, a character which alone is sufficient to establish its distinctness." (*Dall*).

B. BAILEYI Dall. Pl. 19, figs. 65, 66, 67.

Shell when perfectly fresh with a delicate brownish epidermis, which is usually lost, beneath which the shell is brownish flesh color

with irregular pale streaks in harmony with the incremental lines; the margin of the whorl in front of the suture is also often whitish; dead shells are waxen or pure white, often with a ferruginous discoloration; whorls five and a half, the nucleus with a central pit or dimple at the apex, the first two turns regularly ribbed with small, sharp, rather distant ribs, the wider interspaces of which are spirally striate; subsequent whorls with close, fine, sharp, somewhat irregular wrinkles, in harmony with the incremental lines, sparse on the last whorl and crossed by fine sharp close striæ of variable strength, sometimes hardly visible, but in other specimens distinct and granulating the wrinkles; all intermediate grades are observable in comparing many specimens; suture distinct; form like that of *pallidior* on a smaller scale, varying from moderately wide to slender; whorls rounded or moderately flattened; umbilicus small but deeper proportionately than in *pallidior;* aperture rounded ovate, the lip rather widely reflected, thin, the outer and pillar lips approximating, united by a thin wash of callus. (*Dall*).

Alt. 28, diam. 17, alt. of aperture 15 mill.

Alt. 28½, diam. 15, alt. of aperture 16 mill.

Alt. 26, diam. 13½, alt. of aperture 13 mill.

Alt. 25, diam. 16, alt. of aperture 14 mill.

State of Sonora, N.-W. Mexico, at Ortiz (Bailey), *Guaymas* (Palmer, Gabb), *Hermosillo* (Eisen), *Cerro Tordilla, between Guaymas and San Marcial* (Gabb). ? *Cape St. Lucas, L. California* (W. J. Fisher).

Bulimulus (*Scutalus*) *Baileyi* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 640, pl. 71, f. 1.—STEARNS, Proc. U. S. Nat. Mus., xvii, p. 163.—COOPER, Proc. Cal. Acad. Sci. (2), iv, p. 139.

The surface looks smooth to the unaided eye; the aperture has a very regularly ovate form, the foldless columella concave and passing without angle into the parietal margin. The spiral sculpture mentioned in the description is sometimes wanting entirely. The locality "Cape St. Lucas" is probably incorrect. Dall writes as follows:

"This species is larger than *B. xantusi* and the latter is without a reflected lip. *B. baileyi* has the color of *excelsus* rather than *pallidior*. Its variations, within the limits of its smaller size, are similar to those of *pallidior;* the granulation of the surface in the rougher specimens is much finer, but of the same character as that of *B. mon-*

tezuma. The species was at first confounded with *B. xantusi*, the type of which had been mislaid, but when the latter was found and a series compared, it was obvious that they belonged to different sections of the genus. It is named in honor of Mr. Vernon Bailey, of the U. S. Department of Agriculture, who collected it in western Mexico."

This is the only known species of the mainland except *excelsus*, which is very closely allied to the Peninsular group, unless the Mexican record of *sufflatus* proves correct.

B. GABBI Crosse & Fischer. Pl. 19, figs. 58, 59; pl. 33, fig. 34, 35.

Shell umbilicate, ovate-conic, thin; white under a thin, light brown cuticle. Sculpture of irregular longitudinal wrinkles, and close, unequally spaced spiral series of short, rounded granules, situated upon the wrinkles. Spire conic, the apex obtuse, two nepionic whorls well rounded, sculptured with delicate vertical riblets; whorls 5½ to 6, convex, rapidly increasing, separated by deep sutures.

Aperture large, ovate, varying from nearly half to over half the total length of shell; peristome thin, outer lip scarcely expanded; columellar lip broadly dilated above; columella concave below, straight or concave above, with no fold.

Alt. 24, diam. 14; alt. of aperture 12½ mill.

Alt. 23, diam. 12; alt. of aperture 10⅓ mill.

Lower California (Gabb).

Bulimulus (*Scutalus*) *gabbi* CROSSE & FISCHER, Journ. de Conchyl., xx, 1872, p. 223; Moll. Mex., p. 517, pl. 20, f. 19.—COOPER, Proc. Cal. Acad. (2), iii, p. 214, 340 (as probable var. of *xantusi*).

A decidedly more conic species than *B. xantusi* with larger aperture, different sculpture and nucleus. In *B. xantusi* the first whorl is subangular above, with well excavated apical pit, approaching the form seen in *B. inscendens*, and the vertical riblets thereon are fine and close; in *B. gabbi* the earliest whorl is well rounded, with moderate axial pit, as in *B. baileyi*, and the delicate costulæ are much more separated. On the last whorl the granules are everywhere small and rounded, much less coarse and irregular than in *xantusi*.

B. gabbi is considerably like the more granular form of *B. baileyi*, but lacks the conspicuously expanded lip of that species. It has been united with *B. xantusi* by Dall and Cooper, but apparently without comparison of typical examples of *gabbi*. Having before

me the original series collected by Gabb, I do not hesitate to separate the form specifically from *B. xantusi*. Of the latter, among others, we have one of the original specimens collected by Xantus.

Group of B. inscendens.

B. XANTUSI (W. G. Binney). Pl. 19, figs. 60, 61, 62; pl. 33, fig. 36.

Shell very deeply rimate or umbilicate, oblong-conic, thin; white under a thin light brown cuticle; surface lusterless, densely wrinkled longitudinally, wrinkles cut into oblong granules by revolving incised lines (fig. 62), the granulation coarse for the size of the shell. Whorls 6, the apex very obtuse, nepionic shell vertically ribbed, obtusely carinated above, with rather straightly sloping lateral margins; the following whorls convex, the last deeply excavated in the umbilical region.

Aperture less than half the shell's length, ovate; edge of lip a trifle expanded; columellar margin broadly dilated, columella slightly concave, not folded.

Alt. 20, diam. 10½, alt. of aperture 10 mill. (type).

Alt. 21·5, diam. 11, alt. of aperture 9·2 mill.

Alt. 21, diam. 10·2, alt. of aperture 9 mill.

Cape St. Lucas, Lower California (Xantus).

Bulimus xantusi W. G. B., Proc. Acad. N. S. Phila., 1861, p. 331, fig.—PFR., Mal. Bl., 1864, p. 45; Monogr., vi, p. 111.—*Bulimulus* (*Scutalus*) *xantusi* BINN. & BLD., Land and Freshwater Sh. N. A., i, p. 210, f. 362.—CROSSE & FISCHER, Moll. Mex., p. 518, pl. 21, f. 10, 10a.—*B. xantusi* COOPER, Proc. Cal. Acad. Sci. (2), iii, p. 213 (in part?); iv, p. 138, pl. 5, f. 13, pl. 6, f. 29.—*Bulimulus* (*Mesembrinus*) *xantusi* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 641, pl. 72, f. 4.—*Scutalus xantusi* TRYON, Amer. Journ. Conch., iii, p. 173, pl. 14, f. 11.

Finely but intensely granular, resembling *B. montezuma* on a reduced scale, but with the lip-edge barely expanded, not reflexed. It is closely allied to *B. gabbi*, but differs in being decidedly less conic, with smaller aperture, and with high, laterally flattened nuclear whorls, bluntly angular above, instead of well rounded as in *gabbi*.

B. DIGUETI J. Mabille.

Shell openly umbilicate, quite thin, solid, subopaque, hardly shining; corneous-rufescent, sometimes paler, and marked with opaque

yellowish, more or less regular, sparse streaks; irregularly and coarsely striate; oblong-ovate. Apex obtuse, generally eroded, closely and most minutely costulate. Whorls 6, convex, regularly increasing, separated by a deep and narrow suture; the last whorl large, inflated, nearly half the length of the shell, a little ascending in front. Aperture vertical, elongate, the margins subparallel, external margin slightly curved, basal arcuate, columellar broadly expanded, white, partly covering the umbilicus; peristome straight, acute, white.

Alt. 20–22, greatest diam. 10–12; aperture with peristome 10 mill. long, 7 wide. (*Mabille*).

"*Sierra de la Victoria*," *Lower California* (Diguet).

Bulimulus (*Thaumastus*) *Digueti* Mab., l. c., p. 69.

B. BELDINGI Cooper. Pl. 25, fig. 56.

Shell deeply rimate, oblong-conic, chestnut-brown with a few inconspicuous lighter streaks, becoming purplish-black toward the apex, lighter below the sutures; rather solid. Surface slightly shining, with light wrinkles of growth, no spiral striæ. Whorls 6 or 6½, the earliest subcarinate above, with deep apical dimple and sculpture of delicate vertical riblets, the others slightly convex.

Aperture long oval, purplish with the luster of satin within; peristome expanded, narrowly reflexed, fleshy-brown; columella with a faint long fold.

Alt. 29·5, diam. 13, alt. of aperture 14·5 mill.

Alt. 32, diam. 14, alt. of aperture 15 mill;

Mountains of Lower California, near Cape St. Lucas.

Bulimulus inscendens var. *beldingi* Cooper, Proc. Cal. Acad. Sci. (2), iii, p. 209, 1892; p. 340, pl. 13, f. 5, 1893; iv, p. 137, 1894.—*Bulimulus* (*Leptobyrsus*) *inscendens* var. *beldingi* Dall, Proc. U. S. Nat. Mus., xvi, 1893, p. 643.—*Bulimulus beldingi* Dall, Proc. U. S. Nat. Mus., xviii, 1895, p. 5.—*B.* (*Orthotomium*) *beldingi* Dall, Proc. U. S. Nat. Mus., xix, p. 357.

More compact, and stouter than *B. inscendens*, with the peristome more reflexed; no spiral striation or granulation; the typical *beldingi* is also smaller.

Var. *alta* Dall. Pl. 20, fig. 76.

Whorls rounder, shell shorter, last whorl 25–38, aperture 20–38 of the whole length. Whorls 7½; alt. 38, diam. 14 mill.; alt. of aperture 20 mill.

Bulimulus (*Leptobyrsus*) *inscendens* var. *alta* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 643.—COOPER, Proc. Cal. Acad. (2), iv, pp. 137, 143, pl. 5, f. 7.—*Bulimulus* (*Orthotomium*) *beldingi* var. *alta* DALL, Proc. U. S. N. Mus., xix, p. 357.

Var. *monticola* Dall. Pl. 20, fig. 75.

More slender, smooth, compact, last whorl 23–40, aperture 17–40 of the whole length. Recalls *B. bryanti* but has not the divergent last whorl nor the laminiferous pillar. Whorls 7½, alt. 40, diam. 14 mill.; alt. of aperture 17 mill.

B. inscendens v. *monticola* DALL, *op. cit.*—*B. beldingi* v. *monticola* DALL, *op. cit.*—*B. inscendens bryanti* COOPER, Proc. Cal. Acad. Sci. iv, pp. 137, 143, pl. 5, f. 8.

B. CACOTYCUS J. Mabille.

Shell covered rimate-perforate, lengthened, somewhat thick, subopaque, shining; rubescent, marked with opaque white streaks; striated and cancellated with fine decurrent lines. Spire high conic, apex obtuse, striated. Whorls 7, convex-flattened, rapidly increasing, separated by a laciniate, impressed suture, margined by a white thread; last whorl large, subcylindric-elongate, a little compressed on the left side, slightly descending in front. Aperture long-ovate, acute above, vertical; peristome patulous, a little thickened, the margins joined by a very thin, shining, concolored callus; columellar margin white, broadly dilated, covering the rimation, joining the long arc of the outer lip in an obtuse wide angle. Columella twisted, arcuate at base, impressed in the middle. Alt. 58–60, greatest diam. 23 mill.; aperture with peristome, 33 mill. long, 20 wide. (*Mabille*).

Sierras of the south of the Peninsula (Diguet).

Bulimulus (*Scutalus*) *cacotycus* MAB., l. c., p. 69.

B. INSCENDENS (W. G. Binney). Pl. 20, figs. 72, 73, 74.

Shell thin, deeply rimate, lengthened-oblong; chestnut brown, not shining. Surface granular, with growth-wrinkles and (typically) fine incised spiral striæ, but the latter sometimes wanting or weak. Whorls 7, the apex obtuse, nepionic whorl costulate, subcarinate above with deep apical dimple, the following whorls but slightly convex, last whorl long.

Aperture less than half the shell's length, ovate; peristome somewhat expanded outwardly and below, dilated at the columellar mar-

gin, continued in a rather strong callus across the parietal wall. Columella with a long fold above and extending inward (fig. 74).

Alt. 38, diam. 15, alt. of aperture 17 mill.

Lower California: Cape St. Lucas (Xantus); *San Jose del Cabo, San Leonicio, etc.*, 100–3000 ft. alt. (Eisen); *Sierra Laguna*, 3000 ft. (Eisen, smooth var.); *San Lazaro* (Eisen).

Bulimus inscendens W. G. B., Proc. Acad. N. S. Phila., 1861, p. 332, fig.—Pfr., Mal. Bl., 1864, p. 45; Monographia, vi, p. 149; viii, p. 182.—*Bulimulus* (*Mesembrinus*) *inscendens* Binn. & Bld., Land and Freshwater Sh. N. A., p. 197, f. 343.—Crosse & Fischer, Moll. Mex., p. 544, pl. 21, f. 11, 11a.—*Bulimulus* (*Leptobyrsus*) *inscendens* Dall, Proc. U. S. Nat. Mus., xvi, 1893, p. 643, pl. 72, f. 6. —*Bulimulus inscendens* Cooper, Proc. Cal. Acad. Sci. (2), iii, p. 101; also pp. 208, 209; iv, p. 137, pl. 5, f. 4 (exclusive of subspecies and varieties); v, p. 164.—*Mesembrinus inscendens* Tryon, Amer. Journ. Conch., iii, p. 170, pl. 14, f. 21.

"The type specimens of this species show the very distinct granulation due to spiral striæ, and have a nucleus like that of *B. artemesia*, obtusely keeled above. The pillar has a more or less distinct fold, which, however, never becomes laminar and is often feeble. The spiral striation may be coarse, fine or absent. A smooth form, that is, one in which there is no spiral striation or granulation of the axially directed wrinkles, yet which has the form of the type, also occurs. Both this and the type have large shells with flattish whorls and a rather acutely conical spire." (*Dall*).

Section *Plicolumna* J. G. Cooper.

Plicolumna Cooper, Proc. Cal. Acad. Sci. (2), v, p. 164 (June, 1895).—*Pseudorhodea* Dall, Nautilus, ix, p. 51 (Sept., 1895); Proc. U. S. Nat. Mus., xviii, p. 5.

Shell slender, small, with a nearly straight or gyrate and pervious axis in the last whorl and a half, without internal lamina; aperture less than a third the shell's length; jaw as in *Thysanophora*. Type *Columna ramentosa*, J. G. Cooper.

Distribution, Lower California.

The extreme attenuation of the shell is the main differential feature of this group. It is to *Orthotomium* what *Geoceras* is to *Lissoacme*.

The separation of *B. ramentosus* from *B. artemisia* on account of the somewhat cork-screw twisted axis of the former seems scarcely necessary. The axis of *B. artemisia* also is pervious.

Dall has fully exposed the fallacy of the supposition that there is any affinity between these Lower Californian snails and the Columbian genus *Rhodea*. The latter belongs to the Stenogyroid division of *Achatinidæ*. *Columna*, to which genus *B. ramentosus* has also been referred, is a West African group of true *Achatinidæ*, with neither affinity nor superficial resemblance to this group of *Bulimulidæ*.

B. ARTEMISIA (W. G. Binney). Pl. 20, figs. 77, 78, 79; pl. 25, fig. 54.

Shell narrowly rimate, *slender, cylindric-turrited*, thin, dark brown. Surface but slightly shining, with oblique growth-wrinkles and many spiral series of granules (fig. 78). Whorls about 8½, the first carinated above, with excavated apical pit, vertically delicately costulate (fig. 79), those following convex, the last peripherally flattened.

Aperture ovate, *less than one-third the length of shell;* peristome expanded and narrowly reflexed; columellar margin dilated, continued across the parietal wall in a rather heavy callus; columella oblique, not folded.

Alt. 23, diam. 6·2, alt. of aperture 6·3 mill.

Alt. 17·3 diam. 5·6, alt. of aperture 5 mill.

Lower California: Cape St. Lucas (Xantus); *Sierra Laguna* at 3000 ft. alt., *and El Taste Mts.*, 3400–4200 ft. (Eisen); *Sierra San Lazaro, 25 miles north of Cape St. Lucas* (Eisen & Vaslit).

Bulimulus artemisia W. G. B., Proc. Acad. Nat. Sci. Phila., 1861, p. 331, fig.—PFR., Mal. Bl., 1864, p. 45; Monogr., vi, p. 150.—*Bulimulus* (*Peronæus*) *artemisia* BINN. & BLD., Land and Freshwater Sh. N. A., i, p. 210, f. 363.—CROSSE & FISCHER, Moll. Mex., p. 557, pl. 21, f. 12, 12a.—*Bulimulus artemisia* COOPER, Proc. Cal. Acad. Sci., iii, p. 208; iv, p. 137, pl. 5, fig. 17, pl. 6, f. 30; v, p. 163.—*Peronæus artemesia* TRYON, Amer. Journ. Conch., iii, p. 174, pl. 14, f. 22.—*Bulimulus* (*Leptobyrsus*) *artemesia* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 642, pl. 72, f. 5.—*Bulimulus* (*Orthotomium*) *artemesia* DALL, Proc. U. S. Nat. Mus., xix, p. 360, pl. 31, f. 6; pl. 32, f. 6.

With much the same sculpture as the larger species, and an apex a good deal as in the allied *B. inscendens*, this species is very much more slender than any except *B. ramentosus*. It has much the con-

tour of the Chilian *B. pupiformis* (vol. X, p. 138), but with totally dissimilar apical sculpture. The South American and Lower Californian species inhabit similarly arid, mountainous regions.

B. ABBREVIATUS (Cooper). Pl. 20, figs. 80, 81.

Nuclear whorls 1½, vertically flattened, the others reduced to 8 or 9½, the 7th largest, 6th and 8th about equal and much smaller, penultimate not narrowed and larger than fourth. Outline swollen at middle, contracted at suture of body whorl, which is shorter vertically than in *C. ramentosa*. Mouth subcircular, subacutely pointed at its apex, near suture, the constrictions on body whorl deep, partly visible inside, otherwise as in *ramentosa*. A very thin brownish epidermis covered the living shell. Length 0·85, breadth 0·19 inch; mouth 0·22 long, 0·18 wide (*Cooper*).

Sierra Laguna and El Taste Mts., 4200 ft. alt., *Lower California*.

Columna ramentosa var. abbreviata J. G. COOPER, Proc. Cal. Acad. Sci. (2), iii, p. 215.—*Columna (var.?) abbreviata* COOP., t. c., p. 338, pl. 13, f. 2.—*Columna (ramentosa?) abbreviata* COOP., l. c., p. 140, pl. 6, f. 18, 31.

Dall writes of this form as follows: "Dr. Cooper tells us that his '*Columna*' *ramentosa abbreviata* has the apex, surface, and general form of *B. artemesia*, but with a gyrate pillar and pervious axis in the last whorl. In the only specimen I have seen of variety *abbreviata*, the axis is not pervious and the shell is pathologically distorted. I do not doubt that some of Dr. Cooper's examples of this form (of which only nine specimens were collected in two years) have a pervious axis, but I am inclined to regard the shell as a variety of *B. artemesia* rather than *C. ramentosa*, and as a peculiar pathological product rather than a normal development. I fully agree to the proposition that *B. abbreviata*, if it is normal, presents characters (analogous to the gyrate axis of *Leptobyrsus spirifer* in its penultimate whorl) in many respects intermediate between *B. artemesia* and '*Columna*' *ramentosa*, and that all three are derived from the same stock."

In the uncertainty as to the status of this form it may best stand provisionally as a distinct species.

B. RAMENTOSUS (Cooper). Pl. 20, figs. 82, 83, 84, 85.

Shell narrowly rimate, *slender, pillar-shaped*, the apex squarely truncated, 6 or 7 earlier whorls gradually tapering, those below of about equal diameter. Dull brown. Surface lusterless, with sculp-

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ture of oblique growth-wrinkles and numerous spiral series of granules; 1½ earlier whorls vertically costulate (fig. 82). Whorls 11½ to 12 (13 to 16 according to Cooper); the first keeled at the shoulder, concave within the keel, the following increasing whorls convex, becoming less so upon the cylindrical portion of the shell; last whorl flattened peripherally, and with a spiral sulcus or furrow there (often much less pronounced than in fig. 85).

Aperture contained about 5½ times in length of the shell, irregularly oval; peristome thin, somewhat expanded; columellar margin narrowly dilated; columella with a low fold (fig. 83) or none. Ends of peristome connected across parietal wall by a more or less raised and thickened callus.

Alt. 22·5, diam. of cylindrical portion 3·75, alt. of aperture 4 mill.

"Alt. 0·95-1·0, diam. of cylindrical portion 0·18, alt. of aperture 0·19 inch."

Foothills near San José de Cabo, Lower California, near edge of lagoons (Bryant & Eisen); *also on the adjacent mountains* (Eisen, Vaslit).

Rhodea californica subsp.? *ramentosa* COOPER, Proc. Cal. Acad. Sci. (2), iii, p. 102 (1891).—*Columna ramentosa* COOPER, t. c., p. 215 (1892); p. 338, pl. 13, fig. 1 (1893); iv, p. 143, pl. 6, f. 19.—*Plicolumna ramentosa* COOPER, l. c., v, p. 164 (June, 1895).—*Bulimulus* (*Pseudorhodea*) *ramentosus* DALL, Nautilus ix, p. 51 (Sept., 1895); Proc. U. S. Nat. Mus., xviii, p. 5.—*Bulimulus* (*Orthotomium*) *ramentosus* DALL, Proc. U. S. Nat. Mus., xix, p. 363, pl. 31, f. 8 (jaw).

Sculpture as in *B. artemisia*, but the shell is more slender, column shaped, like a *Cylindrella* or *Rhodea*.

"The distinctions between this form and *Rhodea* have been pointed out in the sectional diagnosis, but it may be as well to call attention to some minor details. The base of the last whorl in *B. ramentosus* is rounded and the constriction of the peripheral part of the whorl is variable in different specimens. It would almost seem as if the constriction and the gyration of the pillar were in some way correlated, as the pillar above the last two whorls is not gyrate though somewhat tortuous, and consequently the perviousness of the axis does not extend, as supposed by Cooper, to the entire axis, but only to that part of it included in the last whorl and a half or two whorls. The columellar muscle is exceptionally long, and attached for several whorls, so that it is very difficult to withdraw the animal from its shell even after it has been long in alcohol. The

axis appears to be destitute of any lamellæ, plications or projections of any kind. In fact, the creature, so far as the shell is concerned, is a very attenuated *Leptobyrsus* with its gyrate axis continued into the adult state, whereas in the ordinary *Leptobyrsus* the gyration ceased in time for the pillar of the completed shell to appear normally straight and the axis impervious. In a perfectly adult *B. ramentosus* the margins of the aperture are expanded and slightly thickened, but not reflected. The diameter of the hollow axis varies in different specimens" (*Dall*).

Section *Sonorina* Pilsbry, 1896.

Leptobyrsus Crosse & Fischer, Moll. Terr. et Fluv. Mex., i, p. 475, 1874.—Dall Proc. U. S. Nat. Mus., xvi, 1893, p. 642. Not *Leptobyrsa* Stal.—*Sonorina* Pils., Nautilus, ix, p. 114, 1896.

Bulimuli with the nepionic whorls vertically costulate, the columella bearing within the last whorl a strong, more or less spirally twisted callous lamina. Type *B. spirifer* Gabb. Distribution, Lower California and islands in the Gulf of California.

That all the Bulimuli of Lower California are more closely allied genetically than any of them are to the species of *Orthotomium* inhabiting eastern Mexico, must be acknowledged to be almost demonstrated. Keeping this fact in view, it is also clear that by the exaggeration or acceleration of certain features of growth in a portion of the species, the Peninsular stock has been differentiated into three groups, superficially very distinct. *Sonorina*, by developing an internal callous lamina upon the columella, and *Plicolumna* by its lengthened *Cylindrella*-like growth and emphatic apical keel, have diverged from the normal *Orthotomium* type.

The genesis of the several subordinate groups of *Orthotomium*, if the views herein expressed be correct, is exhibited by the following diagram:—

Probable phylogeny.			Taxonomy.
Original stock of Orthotomium	Eastern Branch	Group of B. alternatus	Orthotomium *s. s.*
	Western Branch	Group of B. montezuma	Orthotomium *s. s.*
		Group of B. ramentosus	Plicolumna.
		Group of B. spirifer	Sonorina.

The name *Leptobyrsus* was changed to *Sonorina* on account of a supposed preoccupation of that term by *Leptobyrsa* in insects. This is in accordance with the usage of most working conchologists in England at the present time, and with that of the American

ornithologists. The propriety or necessity of such changes is still doubtful.

While the costellate apex and internal lamina of *Sonorina* readily distinguish the group from other American Bulimoid snails, certain species of *Neopetræus* (see pl. 32, fig. 33) alone approaching it, some of the species of the subgenus *Euryptyxis* Fischer (Journ. de Conchyl., xxxvi, 1888, p. 317), a Buliminoid group of Arabia, Socotra and Somaliland, are so similar in shell characters as to deceive the very elect. These shells have a similar columellar plate within, and nearly similar apical costulation. In *Euryptyxis* however this costulation is absent from the first whorl or half whorl, and in the forms most resembling *Sonorina*, such as *E. labiosus* Müll., *revoili* Bgt., *maunoirianus* Revoil, etc., there is a heavy callus connecting the ends of the peristome, with a slight vertical groove at its junction with the outer lip. This particular structure does not occur in *Sonorina*. In view then of the great resemblance of oriental and occidental forms, and the slight, elusive nature of their differences, can we believe the two groups to be fundamentally different in genesis? It is here that the testimony of the soft anatomy is given with no uncertain emphasis; for *Euryptyxis* has the characteristic genital complications of *Pupidæ* (see Bourguignat, in Révoil, Faune et Flore des Pays Comalis, p. 96), while in *Sonorina* the anatomy is as unequivocally that of *Bulimulus*.

Several species belonging elsewhere have been referred to the present group. Misled by a false locality label, the writer described as new, *B. hypodon* (Nautilus, x, p. 102, 1897; see pl. 21, figs. 5, 6, 7), which upon mature study proves to be *Euryptyxis labiosus* var. *jehennei* Petit, of Socotra; while *B. zeledoni* Dall (Proc. U. S. Nat. Mus., xvi, 1893, p. 644) is the unicolored form or variety of *Drymœus josephus* (Angas).

Key to species of Sonorina.

(Not including *lapidivagus, dentifer, subspirifer* and *dismenicus*, the internal characters of which are unknown).

I. Peristome but slightly expanded; aperture contained 2½ times in alt. of the shell, *rimatus*, p. 157.

II. Peristome reflexed; aperture larger.

a. Thin; internal lamina corkscrew twisted, *spirifer*, p. 158.

a'. Thick; internal lamina nearly straight, *orthelasmus*, p. 159.

a''. Thin ; internal lamina a tongue-like or triangular lobe ; lip very broad, recurved.

b. Length of aperture and diam. of shell decidedly exceeding half the alt., stout ; alt. about 35 mill., *veseyianus*, p. 160.

a''' Thin ; internal lamina sinuous, emarginate or squarish, very high, *lamellifer*, p. 160.

B. RIMATUS (Pfeiffer). Pl. 21, figs. 1, 2, 3, 4.

"Shell deeply rimate, oblong-turrited, [with rather convex lateral outlines], rather thin, subarcuately striatulate [and under the lens faintly showing long granules produced by spiral decussating striæ, usually visible only in places, and often almost obsolete, fig. 3], pale corneous [or light fleshy-brown, with an indistinct pale subsutural line, somewhat glossy] ; spire turrited, rather obtuse [with nearly two costulate nepionic whorls] ; whorls 7 [to 7½], nearly flat, the last three-eighths the length of the shell, rotund at base.

"Columella with one fold within, [passing into a moderately high, strong, callous lamina spirally encircling the pillar within the last whorl, seen upon breaking the shell, fig. 1]. Aperture oblong-oval ; peristome simple, the margins approximating, joined by a callus ; right margin slightly expanded, [arching far across the whorl above] ; columellar margin dilated, spreading."

"Alt. 33, diam. [above aperture, as usual with Pfr.] 11 mill. ; aperture 13 mill. long, including peristome 4½ [error for 9, evidently from misreading the scale] wide." (*Pfr.*).

Alt. 33, diam. 13 ; alt. of aperture 12·7, width 8·8 mill. (specimen).

Near San Jose del Cabo, 12 miles east of the Cape (Bryant), *to La Paz, Lower California.*

Bulimus rimatus PFR., P. Z. S., 1846, p. 112 ; Monographia, ii, p. 104.—REEVE, Conch. Icon., pl. 54, f. 359.—*Conf.* ANCEY, Bull. Soc. Mal. France, iii, 1886, p. 20.—*Bulimina* (*Petræus*) *rimata* PFR. –CLESSIN, Nomencl. Hel. Viv., p. 286.

Bulimulus (*Mesembrinus*) *inscendens* subsp. *bryanti* COOPER, Proc. Cal. Acad. Sci. (2), iii, pp. 101, 340, pl. 13, f. 4a-c, 1893 ; Zoe, iii, p. 15 ; *Conf.* also, Proc. Cal. Acad. (2), iv, pp. 135–138.—*Bulimulus* (*Leptobyrsus*) *bryanti* (Cooper) DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 645, pl. 71, f. 3, 4.

Pfeiffer's original description of this species is given, with the interpolation of such details as additional specimens suggest. The

species is readily distinguished from *B. inscendens* by the internal lamina, which has about the form of that of *B. spirifer*, though more oblique. It differs conspicuously from *B. spirifer* in being of a more slender form with smaller aperture, the lip but little expanded, surface smooth though without the oily gloss seen in *spirifer*, and with hardly any spiral sculpture or granulation. The apex is like that of *B. spirifer*.

Pfeiffer originally described *B. rimatus* without knowledge of its habitat, and it has later been surmised to be a Central Asian *Buliminus*. Ancey, who had not seen the species, offered the suggestion that it belonged to the South American group of *B. derelictus* (see Vol. X, p. 172). Reeve's figure of Pfeiffer's type is copied in our fig. 4. Von Martens (Biologia, p. 252) is mistaken in referring *B. rimatus* to *B. spirifer*.

B. SPIRIFER (Gabb). Pl. 21, figs. 87, 88, 89, 90, 91,

Shell deeply rimate (the axis perforate above), elongated with oval body-whorl and long conic spire, rather thin; corneous-brown, nearly uniform or with slightly darker oblique streaks, with a whitish sutural line; very glossy, the surface showing slight growth wrinkles, and under the lens, fine spiral series of long granules caused by decussating spiral striæ, variable in development but always rather faint; two apical whorls finely, vertically costulate, the apex obtuse, with axial dimple passing into a deep suture. Whorls 6½ to 7, somewhat convex with shallow sutures, the last whorl oval.

Aperture ovate, fleshy-brown within; peristome broadly expanded, reflexed, sometimes revolute, flesh-tinted; the terminations approaching, connected by a thick or thin callus. Columellar margin dilated above, the columella passing above into a strong, whitish, spirally entering fold, which within the last whorl becomes a high, callous or laminar crest, revolving about the axis (fig. 89), but not penetrating deeper than the last whorl.

Alt. 41, diam. 18; alt. of aperture 19 mill.

Alt. 32, diam, 15; alt. of aperture 16½ mill.

Alt. 33½, diam. 15; alt. of aperture 16 mill.

Lower California, from San Antonio, below La Paz, to near San Borja, in the mountains among rocks (Gabb); *San José, on the Gulf of California* (Belding); *near La Paz* (Brandegee); *around the volcano of Las Virgines* (Diguet).

Bulimus spirifer Gabb (in part), Amer. Journ. Conch., iii, p. 236 (pl. 16, f. 5 ?) 1867.—Binney & Bland, Land and Freshwater Sh. of N. A., i, p. 191, f. 332.—*Bulimulus* (*Leptobyrsus*) *spirifer* Crosse & Fischer, Moll. Terr. Mex., p. 558, pl. 20, f. 26, 27 (exclusive of var. B.).—Dall, Proc. U. S. Nat. Mus., xvi, 1893, p. 644, pl. 72, f. 8.—Mabille, Bull. Soc. Philomathique de Paris (8), vii, p. 66 (1895).—Fischer, Journ. de Conchyl. 1888, p. 318, pl. 13, f. 5.—*Bulimulus spirifer* Cooper, Proc. Cal. Acad. Sci. (2), iii, p. 211.

Like the other species of this region, there is a wide range of variability in size. The "oily gloss of the surface" is noticeable, but its main distinction from the *B. inscendens* group is in the internal lamina on the axis. In some specimens the terminal portion of this may be seen from the aperture, but usually only the columellar fold proper and not the callous lamina, can be seen without breaking the shell. The shape of this lamina varies within narrow limits, and is well shown in fig. 89. It is lacking in young shells (fig. 91) and in all but the last whorl of adults. The narrow lip shown by fig. 87 shows that shell to be immature.

There can be little doubt that Gabb included two species in his original description, *B. spirifer* and *B. lamellifer;* and the figure may have been drawn from the latter, although if so it was colored according to the real *spirifer*. This figure, like that on the same plate representing *B. vesicalis*, is very badly drawn. In the view represented, no prominent columellar fold is visible such as the artist has depicted. Turning to Gabb's typical collection of Lower Californian shells in the Academy collection, we find that he labelled as *spirifer* the glossy, brown species with regular cork-screw lamina (see fig. 89, drawn from one of Gabb's typical lot). This too, seems to be the form he generally distributed as *B. spirifer*. His specimens of *B. lamellifer* were labelled by him "*B. xantusi*, Binney." It seems, therefore, proper to restrict *spirifer* to the form generally known under that name, despite the apparent confusion in the original publication.

Var. *orthelasmus* n. v.

Similar to *B. spirifer*, but very solid and strong, with more convex whorls, the lip broadly reflexed and strongly revolute at edge; internal fold very high and strong, nearly straight and in large part nearly parallel to the axis of the shell, not sinuous or emarginate as in *B. lamellifer*, or strongly spiral as in *B. spirifer;* no spiral sculpture visible. Alt. 33·2, diam. 15, alt. of aperture 16 mill.

Based upon a specimen which has lost its cuticle and color. The exact locality is unknown, but it differs remarkably from *B. spirifer*, its nearest ally, in the great solidity and the shape of the lamina.

B. LAMELLIFER Pilsbry. Pl. 21, figs. 94, 95, 96, 97, 98, 99.

Shell deeply rimate, oblong-conic, rather thin, *white*, sometimes rather translucent. Surface less glossy than in *B. spirifer*, smoothish, under the lens seen to be finely striated, the striæ cut into long granules by spiral lines (fig. 99). Whorls 6½, convex, the last somewhat swollen below; sutures impressed.

Aperture large, ovate; peristome very broadly expanded and reflexed, white, the terminations approaching, joined by a short, thin or heavy callous. Columella dilated above, folded; and from the aperture may be seen a sharp, high, twisted lamina, which within the last whorl (figs. 94, 96) rises into a *very high, thin, square or emarginate, erect plate*, very noticeably obstructing the cavity.

Alt. 34, diam. 17; alt. of aperture 19 mill.

Alt. 33½, diam. 15½; alt. of aperture 15½ mill.

Alt. 32, diam. 15; alt. of aperture 15 mill.

Alt. 23½, diam. 10; alt. of aperture 10⅔ mill.

Lower California (W. M. Gabb), probably on the Gulf side between San Antonio and San Borja.

Bulimulus lamellifer PILSBRY, Nautilus, x, p. 103, January, 1897, —? *Bulimus spirifer* GABB, in part.—? *Bulimulus spirifer* var. *B.* CROSSE & FISCHER, Moll. Terr. Mex., p. 558.

The square, erect plate within the last whorl is a constant difference between this species and *B. spirifer*. *B. lamellifer* is also white instead of corneous brown, less glossy and more distinctly granulose than the other species, on the average smaller, and generally more of the internal lamina may be seen without breaking the shell. Gabb seems to have confused the larger specimens with *B. spirifer*, the smaller with *B. xantusi*. Seventeen examples examined.

B. VESEYIANUS Dall. Pl. 21, figs. 92, 93 (enlarged).

Shell stout, inflated, brownish, polished, with seven whorls; suture appressed, distinct, but shallow; nucleus worn in all the specimens but apparently not differing from that of *B. Bryanti*, except as being more blunt; whorls, except the last, rather rounded, the last whorl somewhat flattened at the periphery; umbilicus large but narrow, overshadowed by a very wide expansion of the pillar-lip;

aperture large, the lips approximated behind, the reflection wide and greatly recurved, of a livid waxen passing into white at the margin; body moderately callous, pillar straight with an obscure fold visible at the aperture, internally with a large, thick sublinguiform lamina; surface of the shell like that of *B. excelsus*, but more polished. Length of shell, 36·5; of last whorl, 25; of aperture, including the lip, 20; maximum of diameter of shell, 20; of aperture, 15 mill. (*Dall*).

Espirito Santo Island, Gulf of California (Belding).

Bulimulus (*Leptobyrsus*) *veseyianus* DALL, Proc. U. S. Nat. Mus., xvi, 1893, p. 645, pl. 72, f. 4, 5.

This species is named in honor of Mr. J. Xantus de Vesey, to whom we owe much of our knowledge of the fauna of Lower California. It is recognizable by its short, stout shape, widely reflected recurved peristome, very narrow space between the commissures of the lips and body, and large subtriangular lamina. Five specimens, all very uniform, were collected by Mr. Belding some ten years ago (*Dall*).

B. LAPIDIVAGUS Mabille.

Shell covered perforate, pupiform, rather thick, a little opaque, destitute of cuticle and color; striate, the striæ delicate, undulating, rather regular. Whorls 7, a little convex, rapidly and regularly increasing, separated by impressed sutures, the last whorl large, inflated, a little tapering below, about equal to three-sixths the length of shell. Aperture a trifle oblique, ovate-subrotund; peristome widely expressed and reflexed, a little thickened, the margins approximating and joined by a very thin callus; outer margin well-arched, columellar margin broadly dilated, covering the perforation; columella obliquely straight, thickened, passing into a twisted median profoundly entering lamina. Alt. 40–43, greatest diam. 16–18 mill.; aperture with peristome 21 mill. long, 17 wide (*Mabille*).

Sierra de Cacachila, south of La Paz (Diguet).

Bulimulus (*Leptobyrsus*) *lapidivagus* MABILLE, Bull. Soc. Philomath. de Paris (8), vii, p. 66, 1895.

B. DENTIFER Mabille.

Shell oblong, turriculate, rimate-perforate, destitute of cuticle, subopaque, solid, striate; ornamented with minute longitudinal riblet-like striæ and spiral lines visible only under a lens; apex rather

acute, shining, narrowly perforate; whorls 6, the first convex, penultimate much more convex, separated by an impressed suture, the last whorl large, nearly two-fifths the entire alt., a little ascending in front. Aperture oblong-ovate, acute above, narrowed below; peristome sub-continuous, broadly expanded, slightly thickened, the margins connected by a rather thick callous, outer margin regularly curved, rather broadly reflexed; columellar margin dilated, patulous, nearly concealing the perforation, joining the basal margin in an obtuse angle; columella twisted, having a deeply entering, median laminiferous tooth. Alt. 24, diam. 9 mill.; aperture with peristome 11 mill. long, 8 wide (*Mabille*).

Volcanic Island of La Tortuga, in the middle of the Gulf of California (Diguet).

Bulimulus (*Leptobyrsus*) *dentifer* MABILLE, Bull. Soc. Philomath. (8) vii, p. 67, 1895.

B. DISMENICUS Mabille.

Shell ovate-elongate, narrowly rimate, rather thick, solid, somewhat opaque, covered with a corneous-rufescent epidermis, a little shining, striatulate; apex rather obtuse, whitish; spire conoidal; whorls 6, little convex, the first slowly, the rest rapidly increasing, separated by a narrowly margined white suture; the last whorl large, ovate oblong, a little inflated, over half the alt. of shell, descending in front. Aperture vertical, ovate, narrowed above, dilated below; peristome slightly thickened, a little reflexed, shining, the outer margin bent in a long arch, basal margin somewhat patulous, columellar margin dilated, covering the perforation; margins joined by a moderately conspicuous glossy callous. Alt. 32, greatest diam. 12 mill.; aperture with peristome 15 mill. long, 10 wide (*Mabille*).

Sierra de la Puna, Lower California, at 1,800 meters elevation (Diguet).

Bulimulus (*Leptobyrsus*) *dismenicus* MABILLE, Bull. Soc. Philomath. (8), vii, p. 67.

B. SUBSPIRIFER Mabille.

Shell narrowly subperforate, elongate, a little thickened, destitute of cuticle, longitudinally striated; striæ dense, filiform, irregular; apex subacute, subperforate; whorls 8, a little convex, the earliest beautifully costulate, angulate at the suture, the last whorl large, inflated, not descending at the aperture. Aperture ovate-elongate,

nearly vertical, the peristome subcontinuous, margins joined by a thin, shining callus, outer margin well incurved and lengthy, effuse toward the base; columellar margin dilated, nearly concealing the perforation; columella obliquely twisted, sinuous. Alt. 47, greatest diam. 17 mill.; aperture with peristome 24 mill. long. 14 wide (*Mabille*).

Lower California (Diguet).

Bulimulus (*Leptobyrsus*) *subspirifer* MABILLE, Bull. Soc. Philomath. (8), vii, p. 67, 1895.

Genus NEOPETRÆUS von Martens, 1885.

Neopetræus v. MART., Conchologische Mittheilungen, i, p. 194 (1885).

Bulimulidæ with ovate or oblong, rather solid shells, rimate or umbilicate, the lip generally expanded; young shells carinated; nepionic sculpture of delicate vertical riblets, predominating over the closer, finer and lower spiral striæ of the intervals. Dentition peculiar. Type *N. millegranus* v. Mart.

Distribution, valley of the Marañon River and adjacent parts of Peru.

Illustrated on plates 29, 30, 31, 32, with some figures on pl. 25 and 33.

Neopetræus was originally proposed as a subgenus of *Otostomus* (Drymæus), for three species differing notably from that genus in dentition, the central teeth being unicuspid, laterals with extremely long, oblique cusps, formed by coalescence of ento- with mesocones, as shown by a nick or emargination in the end. The outermost marginal teeth retain the earlier tricuspid form in some species, but in others seem all to have been transformed, and resemble the laterals.

No conchological features were mentioned by von Martens, distinguishing the group from other subgenera; probably because in general characters, some species have no definable differences from *Scutalus*, others from *Drymæus*.

In the sculpture of the nepionic whorls, however, I find a conchological character which places the group upon a basis of practical utility, enabling us to ascertain its limits, in most cases, without reference to the soft parts, which are necessarily inaccessible in the vast majority of specimens. The nepionic sculpture (pl. 33, fig. 49; pl. 31, fig. 20) consists of delicate subvertical riblets, the intervals between

them bearing closer, lower and finer spirals threads. This is quite unlike the even grating of *Drymœus* (pl. 25, figs. 59, 60, 62), but similar to many species of the third division of *Bulimulus*, comprising *Protoglyptus*, *Nœsiotus* and *Orthotomium*. The finer nepionic sculpture, usually mamillar apex, strongly or acutely keeled young, and generally variegated coloring or dark aperture, are characters conchologically separating *Neopetrœus* from *Protoglyptus*, *Orthotomium* and their allies, though the dentition, when accessible, is of course a far more important difference.

The peculiar color pattern of short oblique stripes in spiral bands, seen in many species of this genus, does not occur in *Bulimulus* or *Drymœus*.

N. BINNEYANUS (Pfeiffer). Pl. 32, figs. 42, 43.

Shell *openly umbilicate, biconic, acutely carinated* peripherally; solid, lusterless, buff or soiled white, the whole surface finely, obliquely striated. Whorls 5½, the earlier 1⅞ whorls bluntly biangular, forming a mamillar apex with deep terminal dimple, sculptured with slender separated vertical riblets with densely and minutely striated intervals (pl. 33, fig. 49); succeeding whorls with sigmoid and then flattened lateral outlines, produced in *an exserted, acute keel which projects above each suture: the last whorl acutely keeled*, not descending anteriorly, the base conic, slightly convex, quite bluntly angular around the funnel shaped umbilicus.

Aperture oblique, ovate, brownish-yellow inside; peristome more or less deeply purple tinted, somewhat thickened within; outer lip angulated in the middle, unexpanded above, slightly expanded below the angle; columellar margin rather broadly dilated; columella simply concave, purple.

Alt. 24, diam. 18, alt. of aperture 14·5 mill.

Alt. 26, diam. 19, alt. of aperture 16 mill.

Andes of prov. Patas, Peru (Farris).

Bulimus binneyanus PFR., Malak. Bl., iv, 1857, p. 229; P. Z. S., 1858, p. 257, pl. 42, f. 4; Monogr., iv, p. 440.—*Bulimulus* (*Bostryx*) *binneyanus* PFR.–CLESS., Nomencl. Hel. Viv., p. 254.—Not *B. binneyanus* Pfr. in Binney, see p. 133.

Similar to *B. reentsi* Phil (vol. x, p. 155) in contour, but with exserted keel, different sculpture, and the apical characters of *Neopetrœus*. It very closely resembles the young stage of *N. filiola* and *vadum*.

N. VADUM Pilsbry, n. sp. Pl. 29, figs. 32, 33, 34.

Shell deeply rimate, oblong turrited, solid and strong, *blue-white*, somewhat shining, the whorls of spire rather strongly and subregularly, obliquely wrinkle-striate, last whorl nearly smooth, seen under the lens to be finely and sparsely malleated. Whorls fully 6½, the earlier 1⅔ subangular above and below, sculptured with fine delicate vertical riblets, higher than the finer, closer and lower spirals between them ; 2½ succeeding whorls flattened, acutely keeled basally, excavated above the keel, which projects above the suture (fig. 33); subsequent whorls not showing the keel, the last whorl oblong, convex, *the suture ascending* at its termination.

Aperture ovate, about half the length of the shell, deep brown within, becoming somewhat purplish on the lip and columella. Peristome rather broadly expanded, the margins converging, brown, fading to purple and then to white at the outer edge; columellar margin subvertical ; columella purplish, passing above into a very wide entering fold (fig. 34).

Alt. 33, diam. 17 ; alt. of aperture 17 mill.

Alt. 33, diam. 16; alt. of aperture 16 mill.

Peru.

The mamillar apex, keeled and wrinkled early whorls and rounded last whorl, as well as the solid, calcareous texture, dark aperture and absence of external color markings, are common to this species and *B. filiola;* but that differs in the almost unexpanded lip, curious columella, straight instead of ascending termination of the suture, and much stouter form.

N. FILIOLA (Pilsbry). Pl. 30, figs. 5, 6, 7, 8.

Shell narrowly umbilicate and rimate, ovate, solid and strong; opaque and calcareous; whitish, flesh tinted below, blue-tinted on the spire, the nepionic whorls pink on the sides, white above; somewhat shining, very irregularly wrinkle-striate, with some short transverse impressions, the early post-nepionic whorls more regularly and obliquely wrinkled. Spire conic, 1⅔ earlier whorls forming a mamillar, projecting apex, flattened above, and sculptured with fine vertical riblets which predominate a little over the finer and closer spiral lirulæ; following two whorls flat, showing a slightly projecting keel above the suture (fig. 8), which is concealed on subsequent whorls; body-whorl oval, not deflected in front. Whorls 6⅔ in all.

Aperture ovate, subvertical, one-half the length of the shell, deep

purple within, fading to buff far within the throat. Peristome white-edged, outer and basal lips obtuse, hardly expanded, columellar lip expanded, with straight, vertical edge; columella very conspicuously obliquely truncated below. Alt. 45, diam. 25, alt. of aperture 22 width 16·5 mill.

Peru.

Drymœus (*Neopetrœus*) *filiola* Pils., Proc. Acad. N. S. Phila., p. 22, Feb. 23, 1897.

The truncated columella gives the effect of a large, obtuse tooth, but the truncation is shown a little too abrupt in fig. 6. The representation of apical sculpture in fig. 8 is too coarse. The species is most nearly related to *N. vadum*, but differs strikingly from that in proportions, characters of the lip and columella, etc.

N. cora (d'Orbigny). Pl. 30, figs. 1, 2.

Shell oblong-ventricose, swollen, rather thick, smooth, shining, marked with transverse striæ visible only under the lens, or sometimes malleated; whitish-rose colored or yellowish, generally unicolored but sometimes with four brown spiral bands frequently interrupted and forming square spots. Spire conic, short, the apex subacute, truncate. Whorls 6, inflated, separated by an even suture.

Aperture large, oval, lateral; lip thin, subreflexed, brown; interior brown; umbilicus large. Alt. 43, diam. 30 mill. (*Orb.*).

Shell deeply arcuate-rimate, ovate-conic, rather solid, smoothish, shining; flesh-colored, irregularly tawny streaked, and sometimes ornamented with four brown bands. Spire conic, rather acute; whorls 7, a little convex, the last slightly shorter than the spire, ascending in front, somewhat sack-shaped at base. Aperture subvertical, truncate-oval, blackish in front; peristome thin, whitish; the right margin slightly expanded, columellar margin broadly spreading. Alt. 44, diam. above aperture 23 mill.; alt. of aperture including peristome 23, breadth 17 mill. (*Pfr.*).

Interior of Peru (Fontaine); *Huanuco* (Paz).

Helix cora d'Orb., Synops., Mag. de Zool., 1835, p. 15; Voy. Amér. Mérid., pl. 34, f. 14, 15.—*Bulimus cora* d'Orb., t. c., p. 307. —Hidalgo, Journ. de Conchyl., 1870, p. 48.—Pfr., Monogr., ii, p. 57; iv, 401; Novit. Conch., iii, p. 418 (description, not figures). —*Buliminus cora* Beck, Index, p. 69.—Not *B. cora* Shuttleworth, or of Pfr., Monogr., iii.—See also, Dohrn, Jahrb. D. M. Ges., 1882, p. 107.

Comparing with *B. proteus*, Orbigny remarks that the character most sharply separating the two species is that *B. cora* in youth is strongly carinated, as far as the third whorl, while in *B. proteus* the whorls are rounded. Hidalgo states that three examples taken at Huanuco by Paz have the color-lines interrupted, giving them some resemblance to *B. tessellatus* Shuttl.

Shuttleworth and Pfeiffer at one time described *N. tessellatus* under the name *cora;* and Dohrn goes so far as to unite *cora, tessellatus, atahualpa* and *papillatus;* but at least the last of these is clearly distinct.

The somewhat more slender form of *cora*, especially its basally produced aperture, seem to be the main distinctions between it and *tessellatus*. The expansion of the outer lip is only slight. Not having specimens, I give above both Orbigny's and Pfeiffer's descriptions of the typical form.

Var. *unicolor* Pfr. Pl. 30, figs. 3, 4.

Unicolored whitish, the aperture edged within with violaceous; peristome more broadly reflexed.

Between Patas and the Maranhon, Peru (Raimondi).

B. cora Orb., Pfr., Novit. Conch., iii, pl. 95, f. 9, 10, but not the description on pp. 418, 419.—*B. cora* var. Pfr., Monogr., vi, p. 49. —*B. cora var. unicolor* Pfr., Nomencl. Hel. Viv., p. 245.

N. TESSELLATUS (Shuttleworth). Pl. 31, figs. 21, 22, 23.

Shell rimate-umbilicate, ovate-conic, solid, rather smooth, opaque; dull corneous, ornamented with square chestnut spots arranged in several bands. Spire rather acute, the apex papillar. Whorls 7, the upper flat, lower a little convex, the last whorl large, nearly equal to the spire, somewhat inflated, produced anteriorly, ascending at the aperture, the base compressed around the umbilicus.

Aperture built forward, suboval, of a deep brown color inside; peristome acute, somewhat thickened within, the upper margin arcuate, scarcely expanded, basal margin a little reflexed, columellar margin straightened, very broad, spreading. Alt. 37, diam. 22 mill.; aperture 20 mill. long, 13 wide. (*Shuttl.*).

Peru (Tschudi); *San Mateo de Huaras* (Almagro); *between Macanya and the Maranhon* (Raimondi).

"*Bulimus cora* Orb. (syn. *B. tessellatus* Shuttl. in litt.)" Shuttleworth, Mittheil. naturforsch. Gesell. in Bern, 1852, p. 200.—*Bul-*

imus cora Orb., Pfr., Monogr., iii, p. 339 (1853).—*Bulimus tessellatus* Shuttl., Pfr., Monogr., iv, p. 402 (1859); vi, p. 49; Novit. Conch., iii, p. 412, pl. 94, f. 14–16.—Hidalgo, Journal de Conchyl. 1870, p. 61; Viaje al Pacifico, p. 123 (including *B. atahualpa*).

A shorter, more compact species than *N. cora*. Hidalgo believes *B. atahualpa* to be a form of *tessellatus*, and in view of the considerable variation observed in other species of *Neopetræus* this may readily be credited.

Var. atahualpa (Dohrn). Pl. 31, figs. 14, 15, 16, 17, 20.

Shell with compressed umbilicus passing into a long curved rimation, stoutly ovate-conic, solid; whitish, slightly brown or flesh tinted, unicolored or with five chestnut bands subcontinuous or more or less interrupted into oblong spots, sometimes obliquely streaked (fig. 17); rather shining, smoothish, becoming obliquely wrinkle-striate on the spire. Whorls nearly 7, the apical 1¾ or 2 purple-brown below, white above, with slender vertical riblets and densely cross striate intervals (fig. 20), the following 2 or more whorls rather flattened, showing a keel at the suture, last whorl inflated, large, *short*, well rounded below, strongly, arcuately ascending in front.

Aperture about half the total alt., ovate-truncate, brown within and showing the bands; peristome acute, more or less thickened inside, usually white with purplish spots, the outer lip a little expanded throughout or scarcely so, columellar lip broadly dilated, forming an extremely wide columellar area; columella concave or straightened, generally showing a weak fold far within. Parietal callus slight, not obscuring the bands.

Alt. 38, diam. 27, alt. of aperture 22 mill. (figs. 18, 19).
Alt. 33, diam. 23, alt. of aperture 18 mill. (specimen).
Alt. 32·5, diam. 21, alt. of aperture 17·5 mill. (fig. 17).
Alt. 43, diam. 21, alt. of aperture 20, width 15 mill. (Dohrn).
Alt. 39, diam. 23, alt. of aperture 22, width 17 mill. (Dohrn).
Alt. 37, diam. 22, alt. of aperture 20, width 16 mill. (Dohrn).
Alt. 36, diam. 20, alt. of aperture 19, width 15 mill. (Dohrn).
Peru (Dohrn); *Patas* (Acad. coll.).

Bulimulus atahualpa Dohrn, Malak. Bl., x, 1863, p. 153.—*Bulimus atahualpa* Pfr., Monogr., vi, p. 49; Novit. Conch., iii, p. 411 pl. 94, f. 11–13.—*Conf.* Hidalgo, Viaje al Pacif., p. 124, and Dohrn, Jahrb. D. M. Gesell., ix, 1882, p. 107.

An extremely variable form, in color " white, fleshy or yellow, one colored or variously maculated and banded with brown, the apex white or roseate " or as described above. The keel of the young shell may be either exserted or quite concealed in the adult; the columellar margin, typically vertical or nearly so, is sometimes slanting (fig. 18).

Hidalgo unites this to *B. tessellatus*, stating that there are intermediate specimens. It should therefore become a variety of that species.

Var. PERINCRASSATUS n. v. Pl. 33, fig. 48; pl. 31, figs. 18, 19.

General form and umbilicus as in *atahualpa*, than which it is larger, more solid, with decidedly expanded outer and basal lips, very strongly thickened within. Whorls 6½, with apex sculptured as in *atahualpa*, two or three earlier whorls ruddy, the rest of the shell white with oblique purplish maculæ disposed in several obscure spiral bands, and a few narrow, oblique, chestnut streaks. Aperture more ample than in *atahualpa*, dull reddish purple within the lip and columella, rich orange-brown inside of the lip-thickening, fading to cream in the throat, the lip-edge white. Another specimen (pl. 31, f. 18, 19) is white with cream colored aperture and lip. Alt. 42, diam. 27 mill.

Peru.

N. PAPILLATUS (Morelet). Pl. 31, figs. 28, 29.

Shell umbilicate, globose-conoid, irregularly and delicately ribbed-sulculate, spiral impressions being visible under a lens; shining, ashy-white becoming tawny toward the apex, and marked with sparse blackish dots. Spire papillate, short, the apex acutely mucronate. Whorls 6, the earlier exserted, convex, the following plano-convex, rapidly increasing, last whorl inflated, round, sometimes obscurely angular, five-eighths the shells length. Umbilicus wide and deep.

Aperture ovate-rounded, tawny inside, the edge paler; peristome simple, acute, thin, expanded throughout, the margins strongly converging above, columellar margin spreading. Alt. 25, diam. 14 mill. (*Morel.*).

Pucra, Peru (Angrand).

Bulimus papillatus MOREL., Journ. de Conchyl., viii, 1860, p. 372; Séries Conch., iii, p. 186, pl. 8, f. 2.—PFR., Monog., vi, p. 40.

A very remarkable shell, with globular last whorl contrasting strangely with the acuminate form of the earlier three; the ends of

the peristome converge strongly, and the umbilicus is deep and widely open. The surface is grooved with very wide superficial striæ, more numerous and stronger on the early whorls; and with sufficient magnification, short concentric impressions crossing the striæ may be seen in some places.

N. CATAMARCANUS (Pfeiffer). Pl. 29, fig. 21.

Shell profoundly umbilicate, ovate-conic, rather solid, irregularly plicate and minutely granulate throughout, not shining, whitish; spire conic, rather obtuse; whorls 6, convex, the last longer than the spire, ascending in front, rounded at base; columella deeply and obsoletely folded.

Aperture vertical, oblong-oval; peristome simple, the margins approaching, the right margin passing outward horizontally from the upper insertion, broadly expanded; columellar margin very much dilated and spreading. Alt. 42, diam. [excluding expansion of lip] 23 mill,; aperture with peristome 27 mill. long, 13 wide. (*Pfr.*).

Andes of the province Caxamarca, Peru (Williams; Cuming coll.).

Bulimus catamarcanus PFR., P. Z. S., 1858, p. 256, pl. 42, f. 5; Malak. Bl., 1859, p. 58; Monogr. Hel. Viv., vi, p. 41.—*Bulimus caxamarcanus* MOREL, Sér. Conchyl., iii, p. 158.

Closely allied, it would seem, to *N. millegranus*, but with the outer lip near its insertion straightened and the columellar lip straight and vertical, and without the color-pattern of that species.

N. MILLEGRANUS (v. Martens). Pl. 31, figs. 24, 25, 26, 27.

Shell umbilicate, ovate-pyramidal, thin, sculptured with rather close spiral series of granules; whitish, painted with irregular, more or less streak-like brown spots arranged in 4 or 5 spiral series. Whorls 6½, the first and second constituting a papillar apex, shining, white and sculptured with fine vertical ribs; third and fourth rapidly increasing, flat, with very oblique, granulose riblets, the suture flat; penultimate whorl a little convex, last whorl rounded basally.

Aperture subvertical, four-sevenths the shell's length, widely elliptical; peristome broadly expanded, white, rather thin, the converging margins separated. Alt. 43, greatest diam. exclusive of

peristome 26, least 20 mill.; aperture including peristome 27 mill. long, 21 wide; excluding peristome 19 and 11. (*Mts.*).

Balzas, eastern Peru, at 963 meters alt. (Stübel).

Otostomus millegranus v. MART., Conchol. Mittheil., p. 177, pl. 32, f. 1–4.—*O.* (*Neopetræus*) *millegranus* MTS., t. c., p. 194.—SCHAKO, t. c., p. 210 (jaw and teeth).

This species, which was found in a very hot, sterile valley in the Marañon region of eastern Peru, resembles the well-known *B. proteus* in sculpture, but in the form of the shell, especially the peristome, and in markings, it is more like *B. altoperuvianus*, which, so far as coloration goes, approaches *B. cora* Orb. and *tessellatus* Shuttl.; so that all of these, in shell characters, seem to form a connected series. In the jaw and dentition, however, this new species is close to *altoperuvianus*, and both differ decidedly from *proteus*. (*Mts.*).

N. RHODOLARYNX Reeve. Pl. 29, figs. 22, 38.

Shell openly umbilicated, oblong-conic, rather solid, rugulose-striate, marked with minute spiral lines; opaque; bluish-white, with sparsely scattered corneous dots. Spire conic, the apex fulvous, rather acute. Whorls 8, convex, the last a little shorter than the spire, rotund, the base a trifle compressed.

Aperture little oblique, rounded-oval, fulvous within; peristome simple, the margins converging, right margin broadly expanded, columellar margin much dilated. Alt. 35, diam. 15½ mill. (*Pfr.*).

Peru: from Ayacucho to gorges of the Apurimac River (Angrand), adhering to rocks; *Mission of Sarayacu* (Deville).

Bulimus rhodolarynx REEVE, P. Z. S., 1849, p. 98; Conch. Icon., pl. 72, f. 518 (July, 1849).—PFR., Monogr., iii, p. 329; vi, p. 35.—MORELET, Sér. Conch., iii, p. 187.—HIDALGO, Journ. de Conchyl., 1870, p. 47; Viaje al Pacifico, Mol., p. 73.—HUPE in Castelnau's Exped., Moll., p. 44, pl. 6, f. 4.—*Bulimus devillei* HUPE, Revue Zool., 1850, p. 641, pl. 15. f. 3.—?? *Scutalus proteus* W. G. BINNEY, Ann. N. Y. Lyc. N. H., ix, p. 36; Ann. N. Y. Acad. Sci., iii, p. 123.

The interior of the aperture varies from delicate purple-rose to quite dark brownish. Aperture rounder than in *B. coræformis*. The apical sculpture is unknown. It looks as though Binney had transposed the radulæ of this species and *B. proteus*.

N. PLATYSTOMUS (Pfeiffer). Pl. 29, fig. 23.

Shell profoundly umbilicated, oblong-conic, solid, obliquely striate; tawny-whitish, with irregular chestnut and brown streaks. Spire conic, the apex subtruncate. Whorls 6½, a little convex, the last about as long as the spire, slightly ascending in front, the base compressed-rotund.

Aperture slightly oblique, oval inside, tawny; peristome simple, of a deep violaceous brown color, margins approaching, the right margin broadly expanded, columellar margin much dilated, spreading. Columella brown-violaceous, subplicate deep within. Alt. 40, diam. 18 mill.; aperture with peristome 20½ mill. long, 15 wide, inside 16 long, 9 wide. (*Pfr.*).

Province Patas, Peru (Dr. Farris).

Bulimus platystomus PFR., P. Z. S., 1858, p. 256, pl. 42, f. 2; Malak. Bl., 1859, p. 37; Monogr., vi, p. 39.

N. BARONI (Fulton). Pl. 25, figs. 64, 65, 66.

Shell slightly umbilicate and broadly rimate, solid, either light brown with a narrow whitish spiral band at the suture, or dirty white with spiral bands of a light brown color; the fine longitudinal striæ or lines of growth are irregularly microscopically wrinkled; apex blunt, apical whorls whitish, with close-set minute thimble-like punctures; whorls 6¼–6¾, convex, the last rather suddenly deflected, giving the umbilical area a rimose character; aperture ovate, dark-brown within, one-half to three-fifths the length of the shell; lip broadly expanded, outer margins white; parietal callus very thin. (*Fulton*).

Long. 34 mill., maj. diam. 22 mill.

Long. 36 mill., maj. diam. 21 mill.

Long. 31 mill., maj. diam. 19 mill.

Rio Yonan, Peru, 4000 feet elevation (C. T. Baron).

Bulimulus (*Drymœus*) *baroni* FULTON, Ann. Mag. Nat. Hist. (6), xx, no. 116, p. 213, pl. 6, f. 8, *a–b*. August, 1897.

Resembles *B. proteus* Brod., in its variableness of form and coloration, but has not the characteristic granular sculpture of that species. It is closely allied to *cora* d'Orb., but is smaller, with more conical spire, and of a more solid growth. (*Fulton*).

Placed provisionally in *Neopetræus* on account of Fulton's comparison with *N. cora*. Otherwise I would consider it a *Scutalus* from

its close resemblance to *B.* (*Scutalus*) *coræformis* Pils. (pl. 25, fig. 61), and from the description of the apical sculpture.

N. ALTOPERUVIANUS (Reeve). Pl. 32, figs. 30, 31.

Shell umbilicate, ovate-conic, rather thin; striated, somewhat decussated by minute concentric impressed lines, a little shining; pale flesh colored, becoming bluish above, painted with chestnut longitudinal lines and spiral series of short oblique streaks and spots; spire convex-conic, rather acute. Whorls 7, a little flattened, the last longer than the spire, somewhat ascending in front, the base obsoletely angular around the compressed umbilicus.

Aperture little oblique, oval, colored like the outside; peristome simple, thin, the margins converging, the right margin expanded, columellar margin much dilated above, a little folded, spreading. Columella with a deep-seated fold. Alt. 47, diam. (above aperture) 21 mill.; aperture 21 mill. long. (*Pfr.*).

Peru: Chachapoyas (W. Lobb); *prov. Patas* (Dr. Farris); *Tambillo* (Stoltzman); *Valley of the Utcubamba River*, about 1800 meters above the sea, *northeastern Peru* (Stübel); *between Balsas and Cajamarca* (Orton).

Bulimus alto-peruvianus RVE., P. Z. S., 1849, p. 99; Conch. Icon. pl. 72, f. 521.—PFR., Monogr., iii, p. 336; iv, 400; vi, 47; viii, p. 60.—LUBOMIRSKI, P. Z. S., 1879, p. 723.—*Drymœus altoperuvianus* W. G. BINN., Ann. Lyc. N. H. N. Y., xi, p. 34, pl. 1, f. ii, iv, (genitalia); Ann. N. Y. Acad. Sci., iii, p. 120, pl. 14, f. F (dentition). — *Otostomus* (*Neopetræus*) *altoperuvianus* MARTENS, Conchol. Mittheil., i, pp. 161, 194.

I have seen no typical specimens of this species. From the figures and descriptions it would seem to differ from *N. patasensis* chiefly in being less ventricose basally, with light colored lip and columella, the outer lip protracted and straightened above.

Var. *gracilior* 'Pfr.' Pils. Pl. 33, figs. 37, 38.

Slenderer, the last whorl less expanded, aperture less dilated obliquely; flesh-colored with rows of oblique spots; obliquely striated and feebly decussated below, the striation stronger on the spire, where two or three whorls following the nepionic ones are flattened, with a keel filling the suture. Columella becoming very broad above, hardly folded; no noticeable fold within the last whorl. Aperture ochre tinted, fading to white on lip and columella. Alt. 43, diam. 21, alt. of aperture 22, greatest width 15.3 mill.

I suppose this to be the variety β, collected by Farris in prov. Patas, and characterized by the single word "*gracilior*" in Monographia iv. The locality of the specimen figured is unknown. It resembles *D. patasensis* in color pattern of the exterior.

B. heterogyrus Philippi. Shell covered perforate (finally imperforate?) oblong-fusiform, plicatulate, partly smooth, thin, whitish, ornamented with brown flammules; whorls 7, the earlier two very smooth, mamillate, following 2–3 flat, with an elevated carina projecting above the suture, last two whorls moderately convex, without trace of the carina; last whorl the length of the spire, flesh-colored. Aperture oblong or nearly half-ovate; columella oblique, straight, half the length of aperture; peristome (imperfect) simple, straight, thin, the columellar margin reflexed above, nearly closing the umbilical chink. Alt. 36, diam. 17 mill.; aperture 19½ mill. long, 9 wide. (*Phil.*).

Department of Libertad, Peru, between Sartimbamba and Chusgon, in "la Sierra."

Bulimus heterogyrus Phil., Malak. Bl. xvi, 1869, p. 42. See Pfr., t. c., p. 90.

One imperfect specimen, very singular in having the early whorls keeled as in *Helix elata*, the later becoming wholly ecarinate. The keeled whorls have stronger, more distant folds; on the last whorl these are to be seen at the suture but become obsolete below. There are also transverse, decussating lines. Pfeiffer writes that the figure of this species sent by Philippi is so similar to the upper portion of *B. altoperuvianus* that he scarcely doubts their identity. There is indeed little in the description to indicate a distinct species, unless the smaller size coupled with the number of whorls be such a feature.

N. sowerbyi (Pfeiffer). Pl. 29, fig. 31.

Shell perforate, ovate-conic, thin, rather smooth; whitish, ornamented with oblique chestnut streaks forming white pyramidal and rhomboidal spots. Spire conic, acute. Whorls 6½, a trifle convex, the last as long as the spire, pale in the middle, with one chestnut band on the tapering base. Columella a little receding.

Aperture oblong-oval; peristome simple, unexpanded; columellar margin angularly, widely reflexed, flat. Alt. 22. diam. 10; alt. of aperture 11½ mill. (*Pfr.*).

Andes of Columbia.

Bulimus sowerbyi PFR., P. Z. S., 1846, p. 114 ; Monogr., ii, p. 195. —REEVE, Conch. Icon., pl. 57, f. 383.

Known to me by description and figure only. The peculiar character of the color-markings suggests a position near *B. altoperuvianus*, etc. Perhaps it is an immature shell. The locality, if correct in the present limits of Columbia, casts some doubt on this generic reference, but it probably applies to the former wide extension of Columbia southward.

N. ARBORIFERUS Pilsbry, n. sp. Pl. 32, figs. 32, 33.

Shell deeply rimate, oblong, solid, typically flesh tinted, more pink above, or nearly white, with numerous narrow streaks of light chestnut, at intervals deep chestnut, in harmony with growth-lines; these streaks branching tree-like along the right side, the branches sometimes anastomosing to form obliquely descending streaks, or cutting the light ground into lozenges; the streaks on the basal volution sometimes combined with crescents, and almost always their intensity is broken by a narrow peripheral light zone; a tract behind the lip generally deeper chestnut or black ; somewhat shining. Whorls 7–7½, the first white or blackish with white crown, nepionic 1½ with the typical *Neopetræus* sculpture (when unworn), the riblets very fine and close, several whorls following rather flattened, with a keel filling the suture, sharply obliquely striate ; last whorl oblong, nearly smooth, sometimes showing faint spiral lines in places; slightly ascending anteriorly.

Aperture oval, half the length of shell or somewhat less, about equal to the greatest diameter of the shell; whitish or buff with bluish markings within ; *outer lip expanded throughout, very dark leaden-brown* with a light edge; columellar lip subvertical, broadly dilated; columella either white or lead-brown showing a rather strong fold deep inside, which within the last whorl either becomes obsolete or is thickened into a stout, heavy callous lamina (as in fig. 33).

Alt. 41·5, diam. 19·5 ; alt. of aperture 20·3, width 15 mill.

Alt. 44·5, diam. 21·5 ; alt. of aperture 22, width 17 mill.

Andes of Peru.

This form resembles *N. altoperuvianus* in color-pattern, and *N. patasensis* in the shape and color of the aperture. It is a narrower, more oblong species than either. The degree of development of the internal callus upon the columella is variable, in some specimens

only a slightly spiral twisted pillar appearing when the shell is cut, and in others a strong callous fold such as we find in certain Lower Californian Bulimuli.

Var. *rectistrigatus* n. v. Pl. 32, figs. 36, 37.

Similar to the type, but with straight chestnut streaks, at intervals darker, sometimes showing a slight tendency to branch on the earlier whorls, as shown in fig. 37. Aperture cream-colored within, the peristome broadly bordered with a dark leaden-brownish color.

Much stouter than *N. lobbii*, which has the same color pattern.

Var. *latistrigatus* n. v. Pl. 32, figs. 34, 35.

Similar to the preceding, but dark purple-brown streaks strongly predominate on the lower volutions; spire obliquely streaked or uniform flesh-tinted or whitish; mouth bluish or leaden within, sometimes streaked. Average size somewhat less.

Alt. 41, diam. 21; alt. of aperture 21 mill.

Alt. 37, diam. 19; alt. of aperture 18·6 mill.

N. PATASENSIS (Pfeiffer). Pl. 32, fig. 38.

Shell deeply rimate-umbilicate, ovate-conic, rather solid, somewhat sharply striate, little shining; fleshy whitish, usually streaked and clouded with light reddish. Spire a little convexly conic, the apex subacute. Whorls 7, the apex rather flat, penultimate more convex, the last whorl longer than the spire, slightly ascending in front, rotund at base, subcompressed at the umbilicus.

Aperture slightly oblique, oval, broadly bordered with violaceous inside; peristome simple, the right margin narrowly expanded, columellar margin much dilated, spreading. Columella brown-violaceous, subplicate deep within. Alt. 47, diam. 24 mill.; aperture 26–27 mill. long. (*Pfr.*).

Var. Shell thinner, deep flesh colored, generally with oblique tawny streaks.

Province Patas, Peru (Dr. Farris).

Bulimus patasensis PFR., P. Z. S., 1858, p. 257, pl. 42, f. 6; Malak. Bl., 1859, p. 38; Monogr., vi, p. 43.

The peristome is dark within, and the last whorl is more expanded basally than in *N. altoperuvianus;* the aperture is less produced outwardly, and the lip is less straightened above. The form is decidedly stouter than in *N. arboriferus* and its varieties.

N. LOBBII (Reeve). Pl. 29, figs. 24, 25, 26.

Shell deeply rimate, oblong-elevated, the length more than double the greatest diameter; solid and strong; white, rather closely but irregularly striped obliquely with ochraceous mingled with a smaller number of deep chestnut stripes; the obtuse apex white or orange. Glossy, almost smooth, with rather faint oblique striæ on the upper whorls. Whorls about 7½, the nepionic 2¼ with fine vertical riblets and finer closer spiral striation (when unworn), the following whorls slightly convex, last whorl oblong, a little ascending in front.

Aperture ovate, less than half the shell's length, fleshy, yellowish or white within; the broadly expanded and reflexed peristome with a broad border of deep brown or lead-brown, pale at the edge; columellar margin subvertical, broadly dilated; columella white or dark, with a strong, long fold above.

Alt. 41·8, diam. 17·6; alt. of aperture 19 mill.

Alt. 42, diam. 18; alt. of aperture 20 mill.

Alt. 44, diam. 19; alt. of aperture 21 mill.

Balsas, valley of the Maranon R., Peru (W. Lobb, H. W. Webb, Stübel); *Cajamarquilla* (Paz).

Bulimus lobbii REEVE, P. Z. S., 1849, p. 98; Conch. Icon., p. 71, f. 516.—PFR., Monogr., iii, p. 340; viii, p. 63.—HIDALGO, Journ. de Conch., 1870, p. 48.—*Otostomus* (*Mesembrinus?*) *lobbi* MARTENS, Conchol. Mittheil., p. 161.—*Drymæus lobbi* W. G. BINNEY, Ann. N. Y. Lyc. N. H., xi, p. 35, pl. 1, f. i, ii, vi, (genitalia); Ann. N. Y. Acad. Sci., iii, p. 121, pl. 15, f. P (jaw); pl. 14, f. E (dentition).

Herr Stübel found it at Balzas clinging to Pata trees and cacti. The young up to about 20 mill. length are angular (fig. 26), the keel being quite sharp in those 10 mill. long.

The coloration of well defined stripes resembles that of *N. arboriferus* var. *rectistrigatus*, but in *lobbi* there are more stripes and none of them show branches. The columellar fold is quite strong, and in some individuals develops a callous process within, somewhat as figured for *N. arboriferus*, pl. 32, fig. 33. As seen from the aperture, in front, it varies a good deal in prominence, from the condition seen in fig. 24 to more conspicuous than in fig. 27, which represents Pfeiffer's *ptychostylus*.

The species must be closely allied to *ptychostylus* and *myristicus*, neither of which is known to me by specimens.

Var. *ptychostylus* (Pfeiffer). Pl. 29, fig. 27.

Shell rimate-umbilicate, fusiform-oblong, solid, smoothish, under the lens seen to be irregularly impressed; spire a little convexly turrited, the apex rather obtuse. Whorls 7, a little convex, the upper ones whitish with a few tawny stripes, the last whorl shorter than the spire, light reddish, streaked and maculated with white, tapering at the base.

Aperture subvertical, auriform, with a blackish border within; peristome simple, whitish, the margins approaching, right margin broadly expanded, columellar margin much dilated. Columella with a strong twisted fold. Alt. 47, diam. (above aperture) 15 mill.; aperture with peristome 23 mill. long, 16 wide. (*Pfr.*).

Province Patas, Peru (Dr. Farris).

Bulimus ptychostylus Pfr., P. Z. S., 1858, p. 256, pl. 42, f. 7; Malak. Bl., 1859, p. 37; Monogr., vi, p. 34.

Seems to be related to *N. lobbi* in the same way that *N. arboriferus* var. *latistrigatus* is to var. *rectistrigatus*.

N. myristicus (Reeve). Pl. 29, fig. 28.

Shell umbilicate, long-ovate, rather solid, wrinkle-striatulate, little shining; flesh colored, irregularly painted with undulating stripes of chestnut. Spire convexly turrited, rather acute; whorls 8, a trifle convex, the last about four-ninths the length of the shell, tumid around the very narrow umbilicus.

Aperture vertical, oval; peristome simple, unexpanded, the columellar margin short, dilated, reflexed and vaulted. Alt. 40, diam. (above aperture) 15; aperture 18 mill. long, 9 wide. (*Pfr.*).

Andes of Caxamarca, Peru (W. Lobb).

Bulimus myristicus Reeve, P. Z. S., 1849, p. 99; Conch. Icon., pl. 72, f. 520.—Pfr., Monographia, iii, p. 426.

Like the typical *N. decussatus* in form, but colored like *N. lobbi* or *N. arboriferus* var. *rectistrigatus*, from both of which it differs in the non-expanded outer lip, shorter columellar lip, and smaller umbilical excavation.

N. decussatus (Reeve). Pl. 32, fig. 39.

Shell umbilicate, ovate-oblong, rather solid, rugulose-striate and decussated by impressed spiral lines; whitish-flesh colored, with spiral series of "short red-brown longitudinal and oblique streaks

crossing each other"; spire conic, rather acute, suture slightly impressed. Whorls 7½, rather flat, the last a little shorter than the spire, rotund around the compressed umbilicus.

Aperture vertical, sinuate-oval; peristome simple, unexpanded, acute, the columellar margin short, much dilated, angularly reflexed. Columella somewhat folded above. Alt. 38, diam. (above aperture) 15½ mill.; aperture 18 mill. long, 9 wide. (*Pfr.*).

Andes of Prov. Caxamarca, Peru (W. Lobb).

Bulimus decussatus Rve., P. Z. S., 1849, p. 99; Conch. Icon., pl. 72, f. 519.—Pfr., Monogr., iii, p. 431.

"Singularly characterized by the bands of short brown streaks, ranging obliquely in the direction opposed to the lines of growth." (*Rve.*).

Var. brownii Pilsbry, n. v. Pl. 32, figs. 40, 41; pl. 33, fig. 39.

Shell slender and elongated, narrowly umbilicate, with slight growth-wrinkles and no spiral striæ. Whitish, with many narrow tawny longitudinal stripes mingled with fewer of a deep chestnut shade, the stripes bearing short oblique branches, and dots arranged in several spiral series. Whorls 8 to 8½, the nepionic 1⅔ smooth (in five specimens seen), whitish, the following whorls but very slightly convex, last whorl a trifle ascending in front or not so.

Aperture decidedly less than half the total alt., long-ovate; peristome hardly expanded, thin or somewhat thickened, the columellar margin dilated; *columella bearing a strong fold deep within*

Alt. 41, diam. 15; alt. of aperture 17 mill.

Alt. 36½, diam. 14; alt. of aperture 14½ mill.

Alt. 39½, diam. 15; alt. of aperture 16 mill.

Peru, (A. D. Brown coll. in A. N. S. P.).

More slender than *N. decussatus*, without spiral striation, and with the aperture much smaller, contained nearly 2½ times in the length of the shell. The smoothness of the apex in the specimens seen may be due to wear, but from the condition of the specimens I am disposed to think that it is a case of degeneration of the sculpture. If so, it is one of a very few Bulimulid species in which this character is really ambiguous as a generic criterion.

One of the specimens before me is a faint creamy flesh tint, with only faint, short markings below the suture and an inconspicuous line of dots at the periphery, without other markings (pl. 33, fig. 39).

N. CŒRULESCENS (Pfeiffer).

Shell umbilicate, ovate oblong, rather solid, striate, *blue-whitish*; spire elongate, the apex acute; *whorls* 7½, a little convex, the last shorter than the spire, *deep blue anteriorly*, base little attenuated, subcompressed; *columella above profoundly dentate-plicate.* Aperture subvertical, oblong, *black-brown inside; peristome black-brown*, the right margin narrowly expanded, columellar margin free, *not reflexed.* Alt. 31, diam. 12½ mill.; aperture 14 mill. long, 6½ wide. (*Pfr.*).

Andes of Prov. Patas, Peru (Dr. Farris).

Bulimus cœrulescens PFR., P. Z. S., 1858, p. 257; Malak. Bl., 1859, p. 39; Monogr., vi, p. 53.—*Bulimulus* (*Drymœus*) *cœrulescens* PFR.–CLESS., Nomencl. Hel. Viv., p. 238.

Described from a specimen in Cuming's collection, and not yet figured. It is known to me by the original description only, and the systematic position is uncertain. Italics of the above description are my own.

Var. COLUMNA Pilsbry, n. v. Pl. 29, figs. 35, 36, 37.

Shell deeply rimate, *long and narrow*, the height nearly three times the greatest diameter, rather thin. *Fleshy white, with numerous longitudinal brown stripes* of varying intensity, being darker at intervals, on the back of the body-whorl becoming diffused and indistinct, the *ground-tint changing to livid blue behind the peristome.* Somewhat shining, sculptured with slight wrinkles of growth, which are rather obsoletely and irregularly cut into spiral series of long granules. Spire with decidedly convex lateral outlines and slightly papillar apex; whorls nearly 8, weakly convex, the last cylindric-oblong, noticeably compressed laterally.

Aperture *oblong, narrow*, decidedly less than half the length of shell, somewhat oblique, *black-brown within the margins*, becoming somewhat lighter and ochraceous deep within; outer lip hardly expanded, its *outer portion nearly straight*, becoming *strongly arcuate toward the upper insertion*, basal lip a trifle expanded; columellar lip vertical, parallel with the outer, dilated. Columella black brown, with a *sharp spiral fold deep within* (fig. 37). Alt. 33, diam. 11·5, alt. of aperture 14·3, greatest width nearly 7 mill.

Peru.

This species had been named "*B. cœrulescens* Pfr." by Mr. A. D. Brown. Compared with Pfeiffer's description of that shell, the

present one differs in being striped with brown on a fleshy or pink ground instead of "cœrulescenti-albida": the outer lip is not expanded, but the columellar lip is decidedly so, and it is distinctly narrower in proportion. Pfeiffer's measurement of the diameter of Bulimi was taken from the greatest convexity of the body-whorl on the left side directly across, and not including the expansion of the aperture below the level of a line so drawn; but even thus, *B. cœrulescens* has a diameter of 12½ mill. with a height of 31, while the species here described measures only 11½ mill. "over all" with a length of 33 mill. It is likely therefore that this is a distinct species.

The color stripes on the spire run more nearly vertical than the growth striæ. Figure 35 is somewhat faulty in showing the outer lip too arcuate; it is straighter in the middle and more suddenly curved near the two ends.

Genus OXYCHONA Mörch, 1852.

= *Oxychona* (Brazilian species only) PILSBRY, Man. of Conch. (2), v, p. 128; ix, p. 189; Nautilus xi, p. 87 (1897).

Shell trochiform with conspicuous peripheral keel and flattened whorls, smoothish, shining, and imperforate; aperture oblique, angular, with expanded or reflexed lip. Nepionic whorls regularly latticed or with stronger vertical riblets. Jaw thin, arcuate, with numerous unequal vertical riblets (see vol. ix, pl. 51, f. 11). Radula peculiar, resembling that of *Zaplagius* (see vol. ix, p. 189, pl. 51, f. 9, 10, *O. bifasciata*).

Distribution, Brazil; type *O. bifasciata* Burrow.

The extraordinary resemblance of the dentition and nepionic sculpture seem to indicate unmistakably a position for this group in the genus *Drymœus*; or at least immediately adjacent thereto, if the general form of the shell and the somewhat different jaw be held sufficient for generic distinction. The Mexican and Central American species formerly associated with *Oxychona* have smooth apices, and will be left in the *Helicidæ* under the generic name *Leptarionta* Crosse & Fischer. Even *H. zhorquinensis*, which so closely resembles *O. bifasciata*, has the smooth apex of *Leptarionta*.

A key to the species will be found in Vol. V, pp. 129–131, with descriptions and figures of *bifasciata* Burrow, *lonchostoma* Mke., *gyrina* Val., and *pileiformis* Moric. (*cf.* Dohrn, Jahrb., x, p. 352).

The apices of *bifasciata* (pl. 33, fig. 40, and fig. 41 x 100), and of *pileiformis* (pl. 33, fig. 42), are here illustrated.

Genus DRYMÆUS Albers, 1850.

Drymœus Alb., Die Hel. 1850, p. 155.—Pilsbry, Nautilus, ix, p. 114.

Otostomus Martens, Binnenmoll. Venezuela's, in Festschr. 100-jährigen Feier Ges. Naturforsch. Freunde zu Berlin, p. 23 (1873). Conchol. Mittheil., ii, p. 191 ; Biologia Centrali Americana, Moll., p. 191 (1893).—Semper, Reisen im Archip. Phil., Landmoll., p. 154 (1874).

Bulimulus subgenus *Goniognathmus* Crosse and Fischer, Moll. Terr. Mex., i, p. 473 (1875).

Bulimulus, sections D, F, Strebel, Beitr. Mex. Land und Süsswasser-Conch., v, pp. 46–48.

Includes most species referred to *Mesembrinus, Eudioptus, Mormus, Navicula, Hamadryas ,Semiclausaria* and *Liostracus* by Albers and others.

Shell ovate or oblong with conic spire, umbilicate or imperforate, rather thin, the aperture varying from subtriangular to ovate, lip simple or expanded, columellar margin reflexed, the apical $1\frac{2}{3}$ whorls with an extremely minute even grating of longitudinal and spiral liræ.

Jaw thin, composed of subvertical, overlapping laminæ soldered together at their inner, free at their outer edges, generally obliquely converging in the middle, leaving a triangular area of shorter laminæ above.

Radula broad, with peculiarly modified teeth ; centrals tricuspid or with the cusps concrescent into one ; laterals oblique, with three large subequal cusps, united toward their bases ; marginals similar, but with the ectocone generally split into two or three denticles.

Genital system with a flagellum on the penis, otherwise simple.

Type, *D. hygrohylœus* (Orbigny). Distribution, tropical and subtropical North and South America.

The references given above show that the generic term *Drymœus*, as accepted herein, is equivalent to "*Otostomus*" of von Martens, and to "*Goniognathmus*" of Crosse and Fischer. But these authors based their groups upon the jaw and dentition of the snail, with no certain correllation of these characters with conchological criteria ; and for this reason, except when dealing with the few species anatomically known, their subgeneric or generic references were largely uncertain. A natural grouping of the great mass of American

Bulimulidæ was impossible; and in the absence of this, the facts of geographic distribution could not be developed, and speculation upon the past history of the group was at a stand still.

The discovery that a finely, regularly latticed apex is correllated with the special form of teeth and jaw of the genus, liberates the systematist and the theorist. The main features of the internal anatomy of any Bulimuloid snail may now be predicted with a very great degree of certainty from an examination of the earliest whorls of the shell.

Drymœus is very closely related to the genera *Oxychona* and *Neopetrœus;* but the former of these has conchological characteristics which most conchologists will probably agree render its retention as a separate genus advisable, and in *Neopetrœus* the peculiar dentition and somewhat diverse apical sculpture are characters deserving recognition in nomenclature, and likely to be lost sight of if the group be merged into *Drymœus*. It is an early branch, which diverged from *Drymœus* near the origin of the latter from the Orthotomous Bulimuli, and with a specialized radula, still retains in large measure, the early pattern of nepionic sculpture.

My selection of the generic name *Drymœus* Alb., 1850, for this group instead of the name *Otostomus* Beck, 1837, used by von Martens since 1873, was a necessary consequence of the facts developed by examination into the history of the latter name. These facts have been briefly set forth in the preceding volume of this work (pp. 95, last paragraph, and 107); but as errors in nomenclature are hard to eradicate, they may bear repetition.

Otostomus was proposed by Beck in 1837 for the species *B. signatus, myotis, lateralis, lagotis* and *navicula.* Gray and Hermannsen, in or about 1847, selected *B. signatus* as the type of the group. H. & A. Adams, in 1855, used *Otostomus* in a generic sense, excluding *signatus* from the group, but including most of the forms of *Zaplagius* and *Drymœus s. s.*, with numerous incongruous species. Von Martens, in 1860, mentions *B. aurisleporis* as the type.

It is universally admitted that when the author of a genus selects no type, one may be selected by the next author concerning himself with the group. In this case, both Gray and Hermannsen named *B. signatus* as the type; Gray in a paper written expressly for the purpose of indicating the types of molluscan genera, Herrmannsen in one of the most widely used works of his generation. The subsequent selection of another species, *B. aurisleporis*, as type of *Otostomus*

was therefore a direct, though doubtless unintentional, violation of an essential rule of nomenclature, everywhere adopted.

Otostomus therefore must be restricted to the species *signatus*. Whether this will prove to have the anatomical peculiarities of *Auris*, or be similar to *Drymœus*, is hardly a proper subject for hypothesis. Should the latter prove to be the case, I would elevate *Otostomus* to generic rank, as it has conchological peculiarities quite sufficient to separate it from *Zaplagius* or *Drymœus*.

The distribution of *Drymœus*, while very wide, is still noticeably less extended than that of the parent genus *Bulimulus*. To the southward, Chili and the Argentine Republic are almost destitute of species; and in the north, Florida and the southern border of Texas are its extreme limits. The West Indies have a few species; but such outlying areas as Lower California, the Galapagos Islands and Fernando Noronha, have apparently not been reached. In general, the group is a continental one, nesiotes being few.

The species of *Drymœus* are largely arboreal, and probably all the polychromatic forms live habitually off the ground; but there are also numerous species, especially in the Peruvian Andes, which live on the ground, under cacti, stones, etc.

Numerous subgenera have been proposed, some of them superfluous. The following may be retained.

* *Apical sculpture typical, an even grating throughout.*

a. *Outer lip expanded or reflexed.*

ZAPLAGIUS.—Shell conic or obliquely conic, with a keel around the truncate or flattened base, which is subperforate and rimate; last whorl ascending in front.

DRYMÆUS.—Shell ovate or oblong, smoothish, generally very light colored, with or without chestnut or blackish variegation.

b. *Outer lip unexpanded, simple.*

MESEMBRINUS.—Shell oblong-ovate or oblong-pyramidal, generally perforate or rimate; columella straightened.

EUDIOPTUS.—Shell ovate or oblong, very thin, translucent and fragile, imperforate or nearly so, the columella arcuate, thread-like; unicolored corneous.

STENOSTYLUS.—Shell ovate, very thin, imperforate or nearly so, the columella arcuate and very slender; streaked or dark colored. Forms resembling *Plectostylus* in appearance, but unspotted, with typical *Drymœus* apical sculpture.

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** *Apical sculpture obscure, the longitudinal elements predominating above, spiral below on each whorl.*

LIOSTRACUS.—Shell pyramidal, glossy, conspicuously colored, the outer lip somewhat expanded.

Of these groups, all seem to be natural assemblages except *Mesembrinus*, which integrades through numerous diverse species with *Drymœus*. It is here retained in its present limits for convenience.

Subgenus ZAPLAGIUS Pilsbry, 1896.

Navicula SPIX, Testac. Bras., p. 22 (in synonymy), pl. 15, type *Navicula fasciata* Spix=*Helix navicula* Wagner (1827). Not *Navicula* DE BLAINV., Dict. Sci. Nat., xxxiv, p. 319 (1825); see also "Les Navicules" Blainv., Man. de Malac., p. 535, and Dict. Class. d'Hist. Nat., xi, p. 472 (1827), a subgenus of *Arca*.—*Otostomus* BECK (in part), Index Moll., p. 55, and of many subsequent authors. Not *Otostomus* as restricted by Gray, see vol. X, p. 107.—*Zaplagius* PILS., Nautilus ix, p. 115, February, 1896.

Conic or obliquely conic Bulimulidæ with typical *Drymœus* apical sculpture (pl. 25, fig. 62), a keel around the truncate or flattened base, subperforate and rimate, the last whorl ascending in front, the lip expanded or reflexed, aperture triangular or ear-shaped. Radula with enormously broad mesocones on central and lateral teeth; jaw deeply arched, with narrow plaits strongly converging mesially. Type *D. navicula*. Distribution, Province of Bahia to Rio Janeiro, Brazil.

From *Otostomus* (type *signatus* Spix), the present group is distinguished by the absence of heavy apertural callosities; from typical *Drymœus* by the flattened base of the shell and broad mesocones accompanied by much reduced side cusps of the teeth.

The Andean species resembling *Zaplagius* somewhat in form of the shell, such as *D. fallax* Pfr., are of wholly different genesis, being a slight modification of typical *Drymœus*. Recognizing this, Pfeiffer has proposed for one of them the subgeneric name *Semiclausuria*, but when the whole series is seen, this term seems superfluous.

Key to species.

I. Diameter of the obliquely-conic shell exceeding the alt.

a. Outer lip inserted on or above the penultimate whorl; basal lip subhorizontal.

b. Base flattened; solid, with wide dark bands; outer lip inserted at top of penultimate whorl, having a conspicuous external "spout"; surface finely malleated throughout, *navicula*, p. 186.

b'. Base convex; white; concave and with oblong-squarish impressions above and below the projecting keel, the outer lip inserted at apex, *involutus*, p. 187.

b''. Base convex; banded and maculate, coarsely malleate above keel and on base; outer lip inserted above middle of penultimate whorl, *uranops*, p. 188.

a'. Outer lip inserted well below suture on the last whorl; basal lip slanting.

b. Banded and maculated, the base flat, alt. nearly as great as diameter, *lateralis*, p. 188.

II. Altitude of the oblong-conic shell greatly exceeding the diameter; mouth higher than wide.

a. Last whorl compressed laterally, base squarely truncated, the aperture rounded or truncate below, *aurismuris*, p. 191.

a'. Last whorl obliquely truncate below, aperture produced basally, *aurisleporis*, p. 189.

D. NAVICULA (Wagner). Pl. 27, figs. 16, 17, 18, 19; pl. 25, fig. 62.

Shell obliquely conic with *flat base*, and long, semicircularly curved rimation; solid; slightly brown- or yellow-tinted white, *becoming pink on the spire*, with *two broad spiral zones of black-chestnut*, the upper one ascending the spire, and on the base a sigmoid chestnut stripe running near and parallel to the umbilical rimation and basal lip, with some faint brown circular lines, sometimes having a broad dark basal band (fig. 19). Surface hardly shining, slightly striated, with faint, fine and close spiral striæ in places, the *last whorl closely malleated throughout.* Whorls 6, the earliest 1¾ sculptured as usual in the genus, *apex white;* last whorl convex above, angular at base, its last third strongly ascending.

Aperture oblique, triangular, *effuse at the produced outer angle;* peristome broadly expanded, *reflexed*, white, the upper lip sinuate, *inserted at the top of the penultimate whorl; basal lip horizontal*, straightened.

Alt. 23, diam. 31½ mill.

Alt. 16, diam. 27½ mill.

Province of Bahia, Brazil.

Helix navicula WAGNER, in Spix, Testacea Bras., p. 22, pl. 15, f. 2, 3.—*Bulimus navicula* DESH., in Lam., An. s. Vert., viii, p. 256; in Fér., Hist., ii, p. 108, pl. 152, f. 9–12.—PFR., Monogr., ii, p. 99 (in part); iii, p. 377.—REEVE, Conch. Icon., pl. 41, f. 258b.—*Otostomus navicula* BECK, Index, p. 55.—*Navicula fasciata* SPIX, Mss. Test. Bras. and on pl. 15.—*Bul.* (*Otostomus*) *navicula* CLESS., Mal. Bl. (n. F.) x, p. 167.

A well known species. In one specimen before me the base is convex, basal angle rounded, obsolete, and the band wanting on the spire. A broad basal band, as shown in fig. 19, is developed in about 33 per cent. of the specimens examined.

D. INVOLUTUS (von Martens). Pl. 27, figs. 20, 21, 22, 23.

Shell rimate-perforate, obliquely conic, carinate, *white* and shining. Whorls 5, the upper slightly convex, lightly striatulate, opaque white; last whorl encircled at the periphery by a prominent thick keel, *latticed-malleate* above and below the keel, *the base convex.*

Aperture subvertical, *ascending to the apex of the shell,* triangular; peristome thin, narrowly expanded throughout. Alt. 15, greater diam. 30, lesser 18½ mill. (*Martens*).

Bahia (Kähne).

Bulimulus involutus MARTENS in Malakozool. Blätt., xiv, 1867, p. 63.—PFR., Monogr., vi, p. 81.—*Otostomus involutus* MARTENS, Conchol. Mittheil., ii, p. 15, pl. 41, f. 1–4.

Von Martens further writes: "Nearly allied to *B. navicula*, but the last whorl ascends more, rising to the upper whorl, and the sculpture is conspicuously different. A broad band above and below the carina shows some peculiar long-rectangular impressions arranged serially, like rows of windows on a building; below and above these the surface is smooth, only with weak striation in the direction of growth-lines, while in *B. navicula* the whole surface of the last whorl has irregular impressions as though hammered. Moreover, *B. navicula* shows only a blunt keel, and is somewhat convex above it, quite flat beneath, while in *B. involutus* the keel stands out like a girdle, the shell on each side of it being somewhat concave. There are no distinct bands, and the apex is not roseate."

Described from one broken example in the Berlin Museum. Among old papers von Martens found a colored drawing of the species, apparently this same specimen before it was broken, the figures given being restored therefrom. According to this drawing

the distal portion of the last whorl is pale isabella yellow, all the rest of the shell including the apex, pure white.

D. URANOPS Pilsbry, n. sp. Pl. 27, figs. 24, 25, 26, 27.

Shell obliquely conic, carinated, perforate and with a semicircular umbilical groove, thin; white, with a narrow brown band just above the periphery, a wider median blue-black girdle, and some faint scattered markings and dark maculæ forming a broad subsutural band, the spire white with *black apex*, base white with an interrupted brown spiral band. Surface rather lusterless, with coarse, low, oblique waves in the direction of growth striæ, *conspicuously and coarsely malleated above the carina and over the base as far inward as the greatest convexity*, showing under the lens rather fine waved spiral lines, subobsolete beneath. Whorls nearly 5, the first black above, the last ascending in front, with a projecting keel, concave below the keel, becoming somewhat swollen around the umbilical perforation.

Aperture decidedly oblique, looking upward about as in *D. navicula*, triangular, banded within; peristome expanded throughout, white, *the upper margin inserted above the middle of the penultimate whorl*, basal lip slightly arcuate, *horizontal*.

Alt. 17, greatest diam. 30, least 18 mill.

Brazil (Anthony).

With the texture and coloring of *D. lateralis* this species combines the general contour of *D. involutus*. From the latter it differs in being banded and with a black apex, in the quite irregular malleation, more extensive beneath, and in the less ascending last whorl, the upper insertion of the outer lip being somewhat above the middle of the penultimate whorl (and therefore a little lower than in *navicula*) instead of being carried up to the initial whorl as in *involutus*.

It differs from *D. navicula* in the convex base with coarse, wrinkle-like malleation, less reflexed peristome, and numerous other characters. The convex base, higher insertion of the outer lip and subhorizontal basal lip separate *D. uranops* from *D. lateralis*.

D. LATERALIS (Menke). Pl. 27, figs. 28, 29, 30, 31, 32, 33.

Shell obliquely conic, with *flattened base* and semicircular rimation, thin; *white with numerous interrupted spiral brown bands and irregular spots* and blotches above, obsolete on the spire, the base with many brown lines, often interrupted or coalescent into bands. Lusterless, rather coarsely wrinkle-striate, with subobsolete spiral

striation. Spire conic, the *apex black tipped;* whorls about 5, but slightly convex, the last angular at the base, slightly convex above (sometimes decidedly so), ascending in front.

Aperture nearly vertical, subtrigonal, banded and maculated within; peristome expanded throughout, white, *the upper margin inserted on the body whorl, below the lowest suture; basal margin obliquely slanting.*

Alt. 24, diam. 27 mill.

Alt. 22, diam. 26 mill.

Alt. 30, diam. 32 mill. *Brazil.*

Bulimus lateralis MENKE, Syn. Meth. Moll. Mus. Menkeano, p. 76 (1828); edit. 2, p. 128.—PFR., Monogr., iii, p. 376; iv, p. 446; Conchyl. Cab., p. x, pl. 49, f. 21–23 (variety).—*Bulimus navicula* PFR., Monogr., ii, p. 99 (in part).—*B. navicula* var. RVE., Conch. Icon., pl. 41, f. 258a.—*Bulimus lyonetianus* KUSTER, Conchyl. Cab. p. 23, pl. 5, f. 5–7 (excluding all synonymy).—*Helix auris leporis a*, FER., Prodr., p. 57, no. 438.—*Otostomus lateralis* BECK, Index, p. 55.

Very readily distinguished from *navicula* by the lower insertion of the outer lip, more erect spire, and different coloration. It is allied to *aurisleporis* in these repects.

In a form of this species figured by Pfeiffer, the whorls, especially the last, are decidedly swollen above and the aperture consequently modified in form (figs. 31, 32, 33). In typical *lateralis* they are but slightly convex. Specimens before me connect the extremes of contour, so that I hardly think the inflated form a true variety, though it may be such.

D. AURISLEPORIS (Bruguière). Pl. 28, figs. 1, 2, 3, 4.

Shell pyramidal, perforate and rimate, with an *obtuse basal keel and obliquely flattened base;* rather thin. Coloration variable, either (1) white or whitish, with a dark band above the basal keel, variously maculated or streaked above, banded or maculated below, or (2) whitish with peripheral band, elsewhere clouded indistinctly with brown, or (3) reddish-brown throughout; some specimens partaking of two of these patterns. Surface lusterless, lightly roughened or malleated in a pattern of more or less distinct small lozenge shaped grains. Whorls about 5½, slightly convex, the last a little ascending in front, its latter half obtusely angular below, excavated behind the columellar lip.

Aperture ear-shaped, subvertical; peristome broadly expanded, the edge reflexed, produced in a rounded lobe at the outer-basal portion; columella showing a strong, short fold far within.

Alt. 41, diam. 25, alt. of aperture 24 mill.

Alt. 32, diam. 19, alt. of aperture 21 mill.

Brazil, provinces of Rio de Janeiro and Espirito Santo: Rio Janeiro, in the Botanical Gardens (Hensel); in the suburb *San Domingo,* on trunks of trees (A. D. Brown); *Sao Sabastiao* (Spix); *Macahe,* among trees and at the roots of plants (Paz and Martinez); *Caravellas,* near the mouth of *Mucury R., prov. Bahia* (Moricand).

Bulimus auris leporis Brug., Encycl. Méth., p. 346.—Wood, Index Testac. Suppl., pl. 8, f. 75.—Pot & Mich., Galerie, i, p. 150, pl. 14, f. 25, 26.—Orb., Voy. Amér. Mérid., p. 313.—Reeve, Conch. Icon., pl. 41, f. 259.—Desh. in Fér., Hist., p. 107, pl. 138, f. 9–12. —Gould, U. S. Expl. Exped., Moll., p. 78, pl. 6, f. 75.—Pfr., Monogr., ii, p. 98; iii, p. 376; iv, p. 445; vi, p. 81; viii, p. 113; Conchyl. Cab., p. x, pl. 22, f. 7, 8.—Heynemann, Malak. Blätt., 1868, p. 109, pl. 5, f. 8 (dentition).—Hidalgo, Viaje al Pacif., p. 70; Journ. de Conchyl., 1870, p. 46.—Clessin, Mal. Bl. (n. F.), x, p. 167.—*Bulimus lagotis* Mke., Syn. Meth. Moll. Mus. Menkeano, p. 26 (1828). —Kuster, Conchyl. Cab., p. 24, pl. 5, f. 12, 13.—*Otostomus lagotis* Beck, Index, p. 55.—*Auricula leporis* Lam., An. s. Vert., iv, p. 138; Desh. in Lam., edit. 2. viii, p. 325.—Delessert, Rec. de Coq., pl. 28, f. 7.—*Auricula auris leporis* Swains., Malacol., p. 181, f. 27.—*Helix auris leporis* Fer., Prodr., p. 56; and in Voy. de Freycinet, p. 483.

Pupa auris leporis Gray, Ann. of Philos. (N. S.), ix, p. 483.—*Stenostoma auritum* Spix, Test. Bras., p. 18, pl. 13, f. 1, 2.—*Otostomus auris leporis* Semper, Reisen im Archip. Phil., Landmoll., iii, p. 155, pl. 15, f. 11 (genitalia), pl. 17, f. 11 (radula), 19 (jaw).—Dohrn, Jahrb. D. M. Ges., x, 1883, p. 351.—*Bulimulus auris leporis* Martens, Malak. Bl., xv, 1868, p. 179.

Extremely variable in color and color-pattern. Probably the small whitish form with intense black or black-brown markings and strong keel (fig. 4) may prove a distinguishable race, *intensior;* but the other color-forms intergrade completely. The extensive series collected by A. D. Brown at San Domingo, near Rio, contains only reddish-brown and brown-clouded whitish shells, none boldly marked. The largest seen are from Tijuca, and measure 44 by 28

mill. The black tip of the apex is usual but by no means invariable.

D. AURISMURIS (Moricand). Pl. 28, figs. 5, 6, 7.

Shell pyramidal with flat or concave base, rimate, moderately solid; white, rarely uniform, but usually with four or five spiral bands of purple-brown, frequently connected by zigzag longitudinal streaks, and occasionally interrupted, the base with one band or none, spire white or banded. Surface smoothish, with some faint, fine malleation and subobsolete spiral striation; shining. Whorls 6½, the first white, with the usual sculpture, the rest nearly flat, last whorl convex above, *laterally compressed, cylindrical*, with a *strong, obtuse angle around the flat or concave base*, which generally shows some spiral furrows.

Aperture ear-shaped, squarish, the peristome white, broadly reflexed, generally angular at the outer lower part; columellar lip dilated.

Alt. 31, diam. 17, alt. of aperture 17 mill.

Alt. 27, diam. 16½, alt. of aperture 14 mill.

Province of Bahia, Brazil (Moricand).

Helix auris muris MORICAND, Mém. Soc. Hist. Nat. Geneve, viii, p. 140, pl. 3, f. 1–3 (1837).—*Bulimus auris muris* PFR., Symb., i, p. 80; ii, p. 111; Monogr., ii, p. 99; vi, p. 81.—REEVE, Conch. Icon., pl. 41, f. 261.—DESH. in Fér., Histoire, p. 106, pl. 138, f. 7, 8.—HUPE in Castelnau's Exped., Moll., p. 57, pl. 9, f. 4.—*Otostomus myotis* BECK, Index Moll., 1837, p. 55.—*Otostomus auris muris* ADS., Gen. Rec. Moll., ii, p. 149.—*Helix uniangulata* FER., according to Pfeiffer. Probably not *Bulimus auris muris* CUNNINGHAM, Trans. Linn. Soc., xxvii, 1871, p. 483, and certainly not *B. auris muris* Shuttl., Mittheil. Naturforsch. Ges. in Bern, 1852, p. 200.

Much more abruptly and less obliquely cut off below than *D. aurisleporis*, with short aperture, not produced downward. Cunningham reports the species from the botanical garden, Rio Janeiro, but what he found there was probably *aurisleporis*.

Subgenus DRYMÆUS Albers.

Drymæus ALB., Die Hel., 1850, p. 155, for *B. xanthostoma* and *B. hygrohylæus* Orb.—*Hamadryas* ALB., *t. c.*, p. 155, for *B. zoographicus* and *B. linostoma* Orb. Not *Hamadryas* Hübner, 1806, Boisduval, 1832, or Gray, 1840.—*Semiclausaria* PFR., Malak. Bl., 1855,

p. 162, for *B. subsemiclausus.*—*Mormus* ALB., Die Hel., 1860, p. 216, type *B. papyraceus.*

The passage of *Drymœus* with expanded or reflexed peristome into *Mesembrinus* with it simple and acute, is a gradual one, and many species are arbitrarily assigned to one or the other section, although the more typical manifestations of each group are conspicuously distinct. In some cases it is easy to see that species of both groups inhabiting one region are of common origin, and more nearly related to each other than to species of their respective sections in distant localities. *Mesembrinus* seems to be the polyphyletic group of the two. This being the case, a geographic grouping into—1, South American, 2, Antillean and 3, North American species has been adopted, although this, too, has its disadvantages.

I. South American species.

Group of D. inœqualis.

D. ABYSSORUM (d'Orbigny). Pl. 37, figs. 3, 4.

Shell oblong, ventricose, quite thin, appearing smooth or even shining to the naked eye, but under the lens showing wrinkles and irregular transverse striæ; dirty white throughout, with wide longitudinal bands of purple-brown, unequal in width; spire lengthened, a little inflated, the apex acute, composed of 7 flattened whorls separated by a little-impressed suture. Aperture oblong, not oblique; peristome wide, somewhat reflexed, thin, whitish; columella perceptibly swollen, umbilicus not widely open. Alt. 50, diam. 25 mill. (*Orb.*).

Along the Rio Grande between Valle Grande and Pescado in the most rugged places, in the easternmost foot-hills of the Bolivian Andes, mainly at a place called Pampa Ruis, under stones and cacti (Orb.); *San Lorenzo, prov. Jujuy, Argentina* (Borelli).

Helix abyssorum ORB., Mag. de Zool., 1835, p. 17.—*Bulimus abyssorum* ORB., Voy. Amér. Mérid., p. 308, pl. 39, f. 7, 8.—PFR., Monogr. ii, p. 46; iii, p. 331; iv, p. 393; vi, p. 39.—? REEVE, Conch. Icon., pl. 36, f. 213.—*Bulimulus abyssorum* BECK, Index Moll., p. 64.—ANCEY, Boll. Mus. Zool. ed Anat. Comp. R. Univ. Torino, xii, No. 309, p. 12 (1897).

There is also a uniform white form of this species. Ancey considers *B. abyssorum, hygrohylæus* and *marmarinus* as varying forms of one species. An adult specimen collected by Dr. Borelli measures:

alt. 47, diam. 21, alt. of aperture 25 mill., and has 7 slightly convex whorls.

D. BOLIVARII (d'Orbigny). Pl. 37, figs. 1, 2.

Shell oblong, ventricose, thick, covered with small longitudinal depressions which lattice the surface; soiled white with some light brown marbling and ornamented with three interrupted bands of deep brown, formed of oblong spots, the apex deep yellow; spire a little inflated, apex acute; composed of 7 slightly convex whorls separated by a shallow suture, the last whorl a little oblique, forming two-thirds the entire length. Aperture very large, oblong, oblique, white within and showing the bands by transparence; the peristome deep yellow, thick, flattened and strongly reflexed; columella solid, very wide, a little twisted and strongly flattened. Alt. 54, diam. 26 mill. (*Orb.*).

Northeastern slope of the eastern cordillera of Cochabamba, Bolivia, at a place called Seja del Monte, in the country of the Yuracari Indians.

Helix bolivarii ORB., Mag. de Zool., 1835, p. 17.—*Bulimus bolivarii* ORB., Voy. Amér. Mérid., p. 309, pl. 39, f. 5, 6.—PFR., Monogr., ii, p. 55; iii, 331; iv, 393; vi, 39.—*Bulimulus bolivarii* BECK, Index, p. 64.

D. BRACHYSTOMA (d'Orbigny). Pl. 37, figs. 7, 8.

Shell oblong, rather short, inflated, somewhat thick, smooth; the single somewhat weathered individual of a dirty white, marbled or clouded throughout with reddish-brown, slightly darker markings indicating three transverse bands. Spire short, slightly inflated, acute at the apex, composed of 7 perceptibly swollen whorls, the last somewhat exceeding one-half of the shell's length. Aperture oval, wide, short in comparison to the other species of this series, its width two-thirds its length, slightly oblique; columella straight, much flattened over the slight umbilicus; peristome thin, strongly reflexed and wide. Alt. 40, diam. 19 mill. (*Orb.*).

Forests of the eastern foothills of the Bolivian Andes, 20 leagues west of Santa Cruz de la Sierra.

Helix brachystoma ORB., Mag. de Zool., 1835, p. 18.—*Bulimus brachystoma* ORB., Voy. Amér. Mérid., p. 309, pl. 39, f. 9, 10.—PFR., Monogr., ii, p. 46.

More inflated and shorter than *D. bolivarii*, and of smoother texture.

D. MARMARINUS (d'Orbigny). Pl. 37, figs. 5, 6.

Shell oblong, ventricose, thick, umbilicate; smoothish, of a reddish-brown color, clouded with browner spots and encircled with four interrupted bands and irregular longitudinal zig-zag flames, the markings disappearing toward the apex; spire somewhat inflated, the apex subacute; whorls 7, flattened, suture shallow. Aperture oblong, sub-auriculate; lip white, thin, widely reflexed; columella twisted, flat. Alt. 42, diam. 18 mill. (*Orb.*).

Slopes of the Rio de Meguilla, prov. Yungas, Bolivia, under dead leaves and stones in the woods (Orb.).

Helix marmarina ORB., Mag. de Zool., 1835, p. 18.—*Bulimus marmarinus* ORB., Voy. Amér. Mérid., p. 310, pl. 39, f. 11, 12.—PFR., Monogr., ii, p. 59 : iii, p. 331 ; iv, p. 389 ; vi, p. 35.—REEVE, Conch. Icon., pl. 41, f. 255.—*Bulimulus marmarinus* BECK, Index, p. 63.—*B. marmorinus* ALB.

More lengthened than *D. brachystoma*, with smaller aperture.

D. HYGROHYLÆUS (d'Orbigny). Pl. 37, figs. 9, 10, 11.

Shell openly rimate, fusiform, with conic spire, rather thick and strong; dirty white or slightly yellowish, with numerous festooned longitudinal stripes of purplish-brown, the festoons sometimes partially coalescent into 5 imperfect spiral bands, and on the spire giving place to oblong spots forming interrupted bands; surface somewhat shining, longitudinally finely wrinkled, the wrinkles by interruption and coalescence forming a fine malleation or reticulate pattern on the latter two whorls; general outlines of spire slightly convex. Whorls 6½ (or 7) quite convex, the latter half of the last not descending, base well rounded.

Aperture oblong, half the shell's length or somewhat more, slightly oblique, showing the external markings within; peristome white, broadly reflexed throughout; columella appearing straight from in front, but entering with a rather strong spiral twist.

Alt. 36, diam. 18 mill.; aperture 20 mill. long (specimen).

Alt. 45, diam. 19 mill. (Orb.).

Eastern part of the province Santa Cruz de la Sierra, Bolivia, throughout the forests northward from Chiquitos, on trees, burying itself in the earth in dry weather.

Helix hygrohylæa ORB., Mag. de Zool., 1835, p. 18.—*Bulimus hygrohylæus* ORB., Voy. Amér. Mérid., p. 311, pl. 40, f. 3–5.—PFR., Monogr., ii, 59; iii, 332; iv, 394; vi, 40.—REEVE, Conch. Icon., pl.

36, f. 215.—*Bulinus hygrohylæus* SOWB., Conch. Illustr., f. 62—*Bulimulus hygrohylæus* BECK, Index, p. 63.

Varies considerably in size and color-pattern; but the rather narrow mouth with widely reflexed, recurved, white peristome, solid texture and finely reticulate surface are more constant. The aperture is decidedly produced basally. The whorls of the spire are more convex than in *D. marmarinus*, which is besides a smoother species.

D. COARCTATUS (Pfeiffer). Pl. 28, figs. 17, 18 (typical) 19, 20 (var.).

Shell rimate-perforate, acutely ovate, solid; whitish encircled by interrupted bands; spire conic, acute; whorls 6½, flattened, the last more convex, as long as the spire.

Aperture oblong, coarctate, the columella thickened, tuberculate; peristome broadly expanded, the right margin thickened within, acutely projecting, a little sinuous in the middle, joining the dilated and reflexed columellar margin at an angle. Alt. 34, diam. 17 mill. (*Pfr.*).

Brazil (Castelnau).

Bulimus coarctatus PFR., P. Z. S., 1845, p. 73; Monogr., ii, p. 90; Novit. Conch., i, p. 80, pl. 22, f. 22, 23; Malak. Bl. v, 1858, p. 166.—HUPE in Castelnau's Exped., Moll., p. 56, pl. 10, f. 4. Not *B. coarctatus* Reeve.

A form with nearly continuous bands is illustrated by Hupé (see pl. 28, figs. 19, 20), who describes it as whitish with blackish bands varying in width, sometimes interrupted, mainly on the earlier whorls, the last whorl ordinarily with three bands; a wider band bounds the umbilicus. Aperture and peristome white.

D. SCHMIDTI (Pfeiffer). Pl. 28, fig. 16.

Shell umbilicate, ovate-conic, ventricose, wrinkle-striatulate, decussated with minute impressed spiral lines; gray-brown marbled with paler. Spire conic, the apex rather obtuse, blackish. Whorls 6½, a little convex, the last a little longer than the spire, inflated, somewhat ascending in front, marked here and there with buff streaks and white dots, more distinctly striated and black-banded around the umbilicus.

Aperture vertical, sinuate-oval, pearly-white inside; columella obliquely receding; peristome white, thin, widely expanded, the margins joined by a thick whitish callus, right margin arcuate,

columellar margin much dilated, slightly vaulted, spreading. Alt. 34, diam. 17, the aperture (inside) 16 mill. long, 8½ wide (*Pfr.*).

Habitat unknown.

Bulimus schmidti Pfr., Malak. Blätter, i, 1854, p. 65; v, 1858, p. 166; Monogr., iv, p. 396.—*B.* (*Scutalus*) *schmidti* Pfr.-Cless., Nomencl. Hel. Viv., v. 249.—*Bulimus coarctatus* Reeve, Conch. Icon., pl. 41, f. 260. Not *B. coarctatus* Pfr.

Very like *coarctatus* in form, but widely differing in sculpture, and especially in the aperture, which is not contracted, the peristome not thickened within nor sinuous (*Pfr.*).

Reeve's figure, here copied, which is said by Pfeiffer to represent his *schmidti* and not *coarctatus*, shows a different color pattern from that described by Pfeiffer, being "white, encircled round the upper part with brown-black interrupted lines, round the lower with bands, lip ivory white"

D. xanthostoma (d'Orbigny). Pl. 36, figs. 52, 53.

Shell lengthened, umbilicate, thick, smooth at the summit, perceptibly rugose on the later whorls; general color roseate, violaceous or yellowish-white, ornamented with broad longitudinal brown flammules, which are irregular, festooned, being enlarged in three places, forming indications of three spiral bands; sometimes only clouded with purple-brown. Spire long, conic, the apex obtuse, black or rose colored; whorls 7, wide, strongly convex, separated by deep subcrenulated sutures.

Aperture very large, oblong; peristome wide, flat, much spreading but not recurved, bright yellow, generally with a violet tint within (*Orb.*).

Alt. 46, diam. 17 mill. (*Orb.*).

Alt. 39, diam. 14 mill. (*Pfr.*).

Northeastern slope of the eastern Cordillera of Bolivia, in the province of Yungas on the ridge between the villages Circuata and Carcuata; *also near Tutulima, north of Cochabamba* (Orb.); *Santa Cruz de la Sierra* (Germain).

Helix xanthostoma Orb., Mag. de Zool., 1835, p. 18.—*Bulimus xanthostoma* Orb., Voy. Amér. Merid., p. 312, pl. 40, f. 1, 2.—Pfr., Monogr., ii, p. 58; iii, 330; iv, 389; vi, 35.—? Reeve, Conch. Icon., pl. 43, f. 271.—*Bulimulus xanthostoma* Beck, Index Moll., p. 64.—*Bulimulus xanthostomus* Angey, Journ. of Conch. (Leeds), vii, p. 92.

Somewhat allied to *D. hygrohylæus*, but differing in the color-scheme, more lengthened form, smoother surface and shorter aperture. The peristome is merely spreading instead of being convex and recurved. Reeve's figures are quoted with doubt, for while f. 271a may possibly be a decolored example of *xanthostoma*, f. 271b looks much like *D. trigonostoma*.

D. ZOOGRAPHICUS (d'Orbigny). Pl. 38, figs. 6, 7, 8.

Shell long, a little swollen, not umbilicate, thin, fragile, translucent, smooth and even glossy, showing some inconspicuous growth-lines. Slightly soiled white with longitudinal, irregular flammules of blackish-brown, zig-zag or festooned, giving the appearance of two interrupted spiral bands. Spire a little swollen, oblique, obtuse at apex, composed of 6 moderately convex whorls, separated by a shallow, even suture. Aperture wide, oblong, oblique; peristome very wide, much expanded, thin, sharp and reflexed; columella thick, twisted. Margins of aperture and base of the columella of a quite dark purple, but this tint does not extend upon the lip, which is white. Alt. 32, diam. 14 mill. (*Orb.*).

Northeastern slope of the Bolivian Cordillera, not far from Tutulima, at the bottom of a ravine through which the Rio Altamachi flows (Orb.); *Valley of Santa Anna, Peru* (Angrand).

Helix zoographica ORB., Mag. de Zool., 1835, p. 19.—*Bulimus zoographicus* ORB., Voy. Amér. Mérid., p. 313, pl. 40, f. 6, 7.—PFR., Monogr., ii, p. 104; viii, p. 67.—MORELET, Séries Conchyliologiques, iii, p. 209.—HUPE in Castelnau's Exped., p. 50, pl. 6, f. 5.—REEVE, Conch. Icon., pl. 70, f. 509.—*Bulimulus zoographicus* BECK, Index, p. 64.

An imperforate species with zig-zag stripes and two or three interrupted bands. Morelet remarks that the specimens collected by Angrand in Peru seem to unite *beyerleanus* Hupé as a variety to *zoographicus*. He gives the following color varieties:—

a. Violaceous, painted with angularly bent streaks and spots of buff.

b. Buff, with zig-zag brown or corneous stripes.

c. Buff, flamed lengthwise with violaceous.

d. Pale tawny.

D. BEYERLEANUS (Hupé). Pl. 38, figs. 4, 5.

Shell elongate, subfusiform, thin, very glossy, smooth; buff, elegantly banded with brownish-black spots or lines, which are longi-

tudinal, sinuous, interrupted and disposed in three transverse series on the last whorl. Spire long, acuminate; whorls 8, somewhat convex. Aperture oblong, deep purple in the throat; the peristome thin, expanded, acute; columella twisted, subtruncate below; outer lip bordered with white, columella with an oblique yellowish-white band (*Hupé*). Alt. 42½, diam. 15; alt. of aperture 23 mill. (from fig.).

Peru (Castelnau).

Bulimus beyerleanus HUPE in Castelnau, Anim. Nouv. ou rares l'Amér. du Sud, Moll., p. 50, pl. 6, f. 6.—PFR., Malak. Bl. 1859, p. 40; Monogr., vi, p. 53.

Probably a form of *D. zoographicus*, as claimed by Morelet.

D. INTERPICTUS (v. Martens). Pl. 34, figs. 12, 13.

Shell imperforate, elongated, thin, smooth, shining; isabelline, painted with wide black stripes which are dotted with isabelline. Spire conic, elongated; whorls 7, rather flat; columella slender, twisted. Aperture perpendicular, flexuous, less than half the total length, ovate-oblong, violaceous within; peristome white, the outer and basal margins rather widely expanded, columellar margin narrowly so below, rather straight, reflexed above and adnate; parietal wall violaceous; throat violescent. Alt. 40, greatest diam. 15, lesser 11 mill.; aperture 19 mill. long, 6½ wide (*Martens*).

On the Chanchamayo, a tributary of the Ucayali River, eastern Peru (Thamm); *Junin* (Jelski).

Bulimulus (*Drymœus*) *interpictus* Martens, Malak. Bl., xiv, 1867, p. 144.—*Bulimus* (*Drymœus*) *interpictus* LUBOMIRSKI, P. Z. S., 1879, p. 723.—*Bulimus interpictus* PFR., Novit. Conch., p. 349, pl. 82, f. 8, 9; Monogr., vi, p. 21.

Nearly allied, says von Martens, to *B. zoographicus* Orb., *yungasensis* Orb. and *beyerleanus* Hupé, from the same region, but well differentiated from all of them by having the lower end of the aperture directed more outward, correlated with the nearly perpendicular direction of the lower half of the columellar margin, and by the character of the markings. The three dark bands which connect the streaks in the species named above, fail completely in this, and the streaks are wider, sometimes forked toward the suture as in the Javan *B. furcillatus* Mouss., and on the last two whorls are always variegated with dots or fine vertical wavy lines of the ground color. *B. inæqualis* is wider and without the light dots upon the stripes.

D. INÆQUALIS (Pfeiffer). Pl. 38, figs. 11, 12, 13, 14, 15.

Shell perforate, obliquely fusiform, rather thin, slightly striated, shining; white, painted with wide, branching purple-black stripes. Spire long-conic, sometimes fulvous above, the apex acute; suture simple. Whorls 7, slightly convex, the second seen to be very minutely decussated under the lens, penultimate a little more convex, the last slightly ascending in front, somewhat tapering at base; columella violaceous, straight, obliquely folded above. Aperture vertical, long ear-shaped, about half the length of shell; colored within like the outside, margined with violaceous; peristome white, broadly expanded, a trifle reflexed, the terminations joined by a very thin callus; right margin regularly arcuate, columellar margin a little dilated, reflexed, nearly covering the perforation. Alt. 43, diam. 13 mill. (*Hidalgo*).

Napa, Ecuador (Martinez); *Banks of the Maranon River* (Pfr.).

Bulimus inæqualis PFR., P. Z. S., 1856, p. 330; Monogr., iv, p. 390; Novit. Conch., ii, p. 158, pl. 42, f. 3–5.—HIDALGO, Jour. de Conchyl., 1870, p. 48; Mol. Viaje al Pacifico, p. 74, pl. 5, f. 4, 5.—*Drymæus inæqualis* MILLER, Mal. Bl., xxv, p. 190.

Hidalgo mentions a variety with three indistinct interrupted bands crossing the streaks, and scarcely any violaceous coloring in the aperture (figs. 14, 15).

D. PETASITES Miller. Pl. 38, figs. 9, 10.

Shell perforated, obliquely fusiform, rather thin, with slight growth-lines and excessively delicate, rather spaced, spiral incised striæ, mainly above the periphery; glossy, shining; white, becoming faintly buff on the last whorl, with *wide, purple-black longitudinal stripes which branch as they approach the suture above*, on the last whorl, and are brown, waved and generally simple on the spire. Lateral outlines of spire slightly convex, apex decidedly obtuse; whorls 6½, slightly convex.

Aperture oblong, slightly oblique, less than half the length of shell, white, faintly lilac tinted, and conspicuously banded inside; peristome broadly expanded, flaring and a trifle effuse below; columella white, spirally twisted above, the margin flatly reflexed above.

Alt. 34, diam. 14 mill.; aperture 16⅔ mill. long.

Nanegal and Sebondoi, in the Pilaton Valley, Ecuador, 1,000 meters alt.; woods among leaves (Boetzkes).

Drymæus petasites MILL., Malak. Bl., xxv, 1878, p. 189; and (n. F.) i, 1879, pl. 7, f. 2a, b.—? *Bulimus fusoides* var. β PFR., Monogr., iii, p. 329.

The general form is more slender than in *D. inæqualis* (Pfr.), the spire longer and the aperture shorter, a trifle less than half the length of shell. The divergence between the two species is not great, however, and they may, perhaps, be found to integrade when full series are brought together. The typical form of *D. fusoides* (Orb.) has less bold color markings and narrower lip.

This species has been referred to *D. orthostoma* Smith, but it appears to be distinct. In *orthostoma* the color streaks are sinuous or scalloped, forming three imperfect bands of lunate spots; the aperture is almost vertical and quite narrow, while in *petasites* there is no tendency to form spiral rows of spots by flexure of the bands, the aperture is noticeably oblique and decidedly wider.

D. ORTHOSTOMA (Smith). Pl. 36, fig. 38.

Shell elongated, ovate-fusiform, slightly rimate, thin, spirally very delicately striated, and sculptured with growth lines; whitish or brownish-white, painted with longitudinal, slightly oblique, waved purple-brown lines and transverse interrupted darker bands (2 on the upper, 3 on the last whorl). Spire lengthened, convexly conic, the apex a little obtuse. Whorls 6½, slightly convex, the last long, ascending a very short distance behind the lip.

Aperture nearly vertical, elongate, inversely ear-shaped, slightly less than one-half the total alt., lilac colored inside, the stripes showing by translucence; columella twisted above, arcuate below; peristome thin, moderately expanded, white, the outer margin of the columella rather straight. Alt. 37, diam. 11½ mill.; aperture 18 mill. long, 6½ wide inside (*Smith*).

Ecuador?

Bulimus (*Drymæus*) *orthostoma* E. A. Smith, P. Z. S., 1877, p. 364, pl. 39, f. 5.

The description of this species is very similar to that of *B. albolabiatus*, yet the two species when viewed side by side have a very different general aspect. The present species differs in having the aperture rather longer, and the whorls are not constricted just beneath the suture. The markings are not so bold or so deep in color; the upper interrupted band is situated nearer the middle of the whorls, and in the last whorl, which has not the reddish line which winds round the base and along the exterior of the lip of *B. albolabiatus*, the markings cease at a short distance (about 4–5 mill.) from the labrum, which is pure white within, and creamy on the

outside, like the rest of the shell; in the other species it is pure white on both sides. (*Smith*).

D. ALBOLABIATUS (Smith). Pl. 36, fig. 37.

Shell ovate fusiform, narrowly (almost covered) perforate, thin, transversely obsoletely striated, and sculptured with oblique growth lines; brown-whitish, lightning streaked with wide oblique stripes of blackish or purple-black, and ornamented with interrupted bands of the same color (2 on the upper, 3 on the last whorl). Spire lengthened, conic, the side slopes slightly convex. Whorls 6½, a little convex, slightly constricted below the sutures, the last ornamented with a reddish line around the base outside the inner lip.

Aperture reversed ear-shaped, subvertical, lilac colored inside with pellucid streaks, a little less than half the total alt. of the shell; peristome thin, white inside and out, rather broadly expanded, the columellar margin reflexed, twisted within. (*Smith*).

Alt. 35, diam. 15, alt. of aperture 17½ mill. (from fig.).

Malacatos, South Ecuador.

Bulimus (*Drymæus*) *albolabiatus* E. A. SMITH, P. Z. S., 1877, p. 363, pl. 39, f. 4.

The nearest ally of this handsome species appears to be *B. fusoides* of d'Orbigny, which, however, is a much more elongated species, without transverse interrupted bands, at all events in the typical form, and with a rosy lip to the aperture. The ground color of this species is a very pale fawn, and the stripes and interrupted bands are almost black, generally edged with brown or olive-brown. (*Smith*).

D. FUSOIDES (d'Orbigny). Pl. 38, figs. 16, 17, 18, 19.

Shell elongated, fusiform, very thin, transparent, smooth, with slight growth lines; rose-white, with longitudinal wide lines and sometimes dots of bistre. Spire long, oblique, swollen, obtuse at apex, composed of 7 whorls, but little convex, the last more oblique, distinctly compressed, somewhat less than half the total length of shell; suture smooth, bordered by an impression parallel to it. Aperture oblong, oblique, of a rose-violet color inside and out; peristome broad, acute and strongly expanded; columella but little swollen, arcuate. Alt. 40, diam. 13 mill. (*Orb.*).

Bolivia: Northeast slope of the eastern Cordillera of Cochabamba, at a place called "Yunga de la Palma" (Orb.); *Cocopata* (Bridges); *Santa Cruz de la Sierra* (Ancey).

Helix fusoides Orb., Mag. de Zool., 1835, p. 19.—*Bulimus fusoides* Orb., Voy. Amér. Mérid., p. 315, pl. 40, f. 12, 13.—Reeve, Conch. Icon., pl. 18, f. 106.—Pfr., Conchyl. Cab., p. 102, pl. 33, f. 7, 8; Monogr., ii, 51; iii, 329; iv, 385: vi, 34.—*Bulimulus fusoides* Alb., (*Drymæus*) Patel, Cat., p. 105.—Ancey, Journ. of Conch., vii, p. 92.

This species, while allied to *D. petasites*, *D. orthostoma* and other Ecuador forms, is apparently distinct from any of them, and confined to Bolivia. Ancey writes: "the specimens from Santa Cruz de la Sierra are yellowish-ochraceous, and are provided with more or less distinct and numerous obscure stripes, which in some individuals are absent or very faint. The color of the aperture is characteristic. Some specimens are more slender than others."

D. lusorius (Pfeiffer). *Unfigured.*

Shell slightly perforated, subfusiform-oblong, thin, smooth; fleshy-whitish, ornamented with sparse undulating streaks of chestnut. Spire convex-conic, rather acute; suture indistinctly margined. Whorls 5, a little convex, the last a little shorter than the spire, tapering at base. Aperture a little oblique, oval, with streaks of deeper color inside; peristome thin, right margin curved above, then broadly expanded; columella somewhat compressed, with a twisted fold, receding, columellar margin a little reflexed. Alt. 25, diam. 10 mill.; aperture 12 mill. long, 7 wide. (*Pfr.*).

Banks of the Amazon River, Brazil (Cuming coll.).

Bulimus lusorius Pfr., P. Z. S., 1854, p. 291; Monogr., iv, p. 386; vi, p. 34.—*Bulimus* (*Drymæus*) *lusorius* Pfr., Malak. Blätter, 1855, p. 151.

Allied to *B. fusoides* Orb. and *B. pealianus* Lea. (*Pfr.*).

D. lophoicus (d'Orbigny). Pl. 36, figs. 39, 40.

Shell elongated, very distinctly umbilicated, thin, rugose on the later whorls, the earlier nearly smooth; gray-white or rose, varied with irregular longitudinal lines of brown or whitish, the apex sometimes deeply rose colored; spire lengthened, nearly conic, with obtuse apex, composed of 8 wide swollen whorls separated by a smooth and quite deep suture. Aperture yellowish, especially at the margins, oval or oblong, not oblique, the peristome quite thick, little reflexed; columella thick, swollen, a little twisted. Alt. 33, diam. 12 mill. (*Orb.*).

Eastern slope of the Bolivian Andes in the province of Yungas, principally on the moist wooded mountains near the villages of Yanacaché and Chupé (*Orb.*).

Helix lophoica ORB., Mag. de Zool., 1835, p. 19.—*Bulimus lophoicus* ORB., Voy. Amér. Mérid., p. 316, pl. 40, f. 14, 15.—PFR., Monogr., ii, 60; iii, 322; iv, 402; vi, 49.—*Bulinus lophoicus* SOW., Conch. Illustr., f. 65.—*Bulimulus lophoicus* BECK, Index, p. 64.

Closely allied, writes d'Orbigny, to *B. yungasensis*, but easy to distinguish by the longer, less swollen spire, straight instead of oblique, and narrower aperture, more twisted columella, and finally by the lineolation, roseate tint, and want of brown spots.

D. FERIATUS (Reeve). Pl. 34, fig. 10.

Shell slightly perforate, oblong-fusiform, solid, rugulose-striate; whitish, irregularly marked with brown streaks, which are generally dotted with white. Spire conic, rather acute; whorls 5½, a little convex, the last a little longer than the spire, attenuated at base, subcompressed; columella subvertical, somewhat straightened. Aperture nearly vertical, acuminate-oblong; peristome narrowly expanded, the right margin spreading, columellar margin dilated above, subappressed. Alt. 28, diam. 11 mill.; aperture 14 mill. long. (*Pfr.*).

Habitat unknown.

Bulimus feriatus REEVE, Conch. Icon., pl. 48, f. 314.—PFR., Monogr., iii, p. 323.

D. YUNGASENSIS (d'Orbigny). Pl. 36, fig. 34, 35.

Shell elongated, a little swollen, very distinctly umbilicated, thin, fragile; the surface irregularly malleated and rugose; grayish-rose with clouds of brown and wide brown longitudinal markings, forming three interrupted brown bands. Spire long, swollen, very obtuse at the apex, composed of 6 convex whorls separated by a deep suture, the last whorl very large and oblique. Aperture oblong, a little oblique, brownish-purple within; peristome yellowish, thin, expanded, but not wide nor strongly reflexed; columella wide, flattened, arcuate, but not twisted. Alt. 35, diam. 13 mill. (*Orb.*).

Eastern slope of the Bolivian Andes, on the Rio de Meguilla near its confluence with the Rio de la Paz, under dead leaves and stones (Orb.).

Bulimus yungasensis Orb., Voy. Amér. Mérid., p. 316, pl. 40, f. 8.—Pfr., Monogr., ii, p. 57; iii, 345; iv, 408; vi, 53.—Reeve, Conch. Icon., pl. 65, f. 456.

Some individuals, says Orbigny, entirely lack spots. It is evidently near *D. zoographicus*, but differs in being perforate and without the columellar twist of that species. Pfeiffer describes a Cumingian specimen apparently from Orbigny, and not in good condition, (fig. 35) as grayish-white with three series of brown spots; aperture a little shorter than the spire, the last whorl tapering below; columella subplicate. Alt. 29, diam. 11 mill.; aperture 14½ mill. long, 6 wide.

D. ochrocheilus (Smith). Pl. 36, fig. 36.

Shell ovate-fusiform, narrowly rimate, rather thin, obliquely irregularly striated and malleated; dull whitish, with series (2 on the upper, 3 on the last whorl) of irregular brown spots. Spire conic, the lateral outlines slightly convex; whorls 7, slowly increasing, a little convex, separated by sutures which are but slightly oblique, the last whorl tapering at base.

Aperture oblong, narrowly elliptical, half the length of shell, somewhat oblique; peristome rather widely expanded, yellow, the columellar margin reflexed, lips joined by a thin yellowish callus. Alt. 37, diam. 13; aperture 20 mill. long, 5½ wide. (*Smith*).

Malacatos, south Ecuador.

Bulimus (*Drymœus*) *ochrocheilus* E. A. Smith, P. Z. S., 1877, p. 362, pl. 39, f. 1.

This species is closely allied to *B. yungasensis* of d'Orbigny, and differs from it chiefly with regard to the aperture, which is much longer, narrower and differently colored. Owing to the narrowness of the aperture, the last whorl is also much attenuated, considerably more so than in d'Orbigny's species, which was obtained in Bolivia more than a thousand miles south of where the present form was collected.

The transverse brown spotting appears rather like interrupted bands than series of spots. These are connected by opaque white lines, and the uppermost series is the narrowest.

The lines of growth are rather coarse towards the labrum, which shows the yellow color of the interior on the outside. (*Smith*).

D. CANTATUS (Reeve). Pl. 40, fig. 9.

Shell somewhat fusiformly oblong, somewhat obliquely produced at the base, umbilicated, whorls six to seven in number, smooth or rather obscurely rudely striated, columella curved inwards in the middle, aperture sinuated at the base, lip expanded, partially reflected; light fawn-white, indistinctly marked with small squarish distant spots, lip and columella colored interiorly with rose-purple (*Rve.*).

Alt. 39½, diam. 19 mill.; alt. of aperture 20 mill. (from fig.).

Tarma, Peru (Jelski); *Habitat unknown* (Dennison Coll.).

Bulimus cantatus REEVE, Conch. Icon., v, pl. 56, f. 375.—PFR., Monogr., iii, p. 375.—LUBOMIRSKI, P. Z. S., 1879, p. 723.

D. PEELII (Reeve). Pl. 34, figs. 7, 8.

Shell slightly perforate, long ovate, subfusiform, rather solid, closely plicaculate striate (the folds here and there almost obsolete); whitish, ornamented with rather wide reddish, white-dotted stripes, more or less interrupted. Spire somewhat irregular, conic, the apex small, acute; suture linear above, then becoming deeper and delicately crenulated. Whorls 7, the earlier 5 rather flat, the penultimate convex, irregular, the last slightly shorter than the spire, subarcuately ascending in front, tapering at base and somewhat compressed; columella callous, twisted, orange-colored.

Aperture subvertical, rhombic-semi-oval, white deep within, showing the bands; peristome buff, thin, rather broadly expanded, the margins joined by a very thin callus, right margin with long, subregular curve, basal narrowly arcuate, somewhat effuse, columellar margin thickened. Alt. 54, diam. 20; aperture 27 mill. long, 14 wide (*Pfr.*).

On the Amazon in Peru (Rve.); *Canelos, Ecuador* (Stübel).

Bulimus peelii RVE., P. Z. S., 1859, p. 123.—PFR., Monogr. Hel. Viv., vi, p. 28; Novit. Conch., iv, p. 144, pl. 133, f. 6, 7; Monogr., viii, p. 49.—*Otostomus* (*Drymæus*) *peelii* MARTENS, Conch. Mittheil., p. 160.—*Drymæus peelii* JOUSS., Bull. Soc. Zool. France, 1887, p. 217.—*Bulimulus pealei* PAETEL, Catal., p. 100.

A form with the apex violaceous was collected by Stübel.

D. FORDII n. sp. Pl. 38, figs. 1, 2, 3.

Shell fusiform, minutely rimate, moderately solid; white, with irregular longitudinal streaks of chestnut, more or less vermiculate-

marked with whitish, and showing two series of arrow-shaped blotches forming interrupted bands, obsolete in some specimens; somewhat shining, with superficial wrinkle striæ, becoming conspicuous on the latter part of the last whorl, especially below. Spire with slightly convex lateral outlines, apex purple or white. Whorls 6, the upper ones but slightly, the penultimate strongly convex; last whorl decidedly tapering below, where it is produced and perceptibly pinched; suture slightly ascending near its termination.

Aperture large, semi-oval, whitish within, somewhat oblique; *peristome deep lilac* or purple, with the blunt outer edge white, the outer lip but slightly expanded above, *very broadly expanded and flaring* below where it passes into the oblique basal lip; *columella strongly twisted, reversed sigmoid*, purplish, its inner edge cord-like; reflexed and closely appressed, leaving only a small chink at the lower end of the reflexed portion. Parietal callus a mere transparent glaze.

Alt. 38½, diam. 16; alt. of aperture 20 mill.

Alt. 42, diam. 18; alt. of aperture 21 mill.

Habitat unknown.

Peculiar in the oblique passage of the outer into the basal lips, their broadly flaring expansion, and the very strongly sigmoid curvature of the columella, which has not been shown as strongly in the drawings as it is in the shells. The deep-lilac purple of the lip is as prominent as in *D. glaucostoma*. Described from two specimens of unknown origin, from the collection of Mr. John Ford.

D. GERMAINI (Ancey).

Shell oblong-attenuated, shining, very narrowly rimate, showing incised spiral striæ under a strong lens; somewhat bluish-white, with irregularly flexuous or lightning-zigzagged streaks of tawny-bluish. Spire moderately produced, rather obtuse. Whorls 6½, convex, separated by rather deep sutures, the last whorl attenuated, oblong, making a short, sudden ascent at the aperture. Aperture a little oblique, oblong, slightly lunate, angular above, patulous; interior with the parietal wall and columella lilac colored, becoming whitish in the throat, and showing the streaks by translucence; peristome expanded throughout, the columella a little twisted, nearly straight, a little more dilated, covering the perforation; terminations remote. Alt. 28, diam. 11 mill.; alt. of aperture 14 mill. (*Ancey*).

Matto-Grosso, Brazil (Germain).

Bulimulus germaini ANCEY, Journal of Conchology, vii, p. 91 (July, 1892).

A single specimen was found. It is somewhat like a small, thin *B. felix*, but otherwise quite distinct from the New Granada shell (*Ancey*).

D. VIOLACEUS (Mousson). Pl. 35, figs. 30. 31 (typical), 26, 27, 28, 29, 32.

Shell broadly rimate-umbilicate, ovate-oblong, moderately solid; yellowish or faintly brown tinted, typically with longitudinal slightly irregular gray or purplish-brown streaks, which are lineolate with fine yellow or whitish vermiculate lines (but in other specimens the streaks are acutely festooned or otherwise irregular); shining, with slight growth wrinkles, more or less fine malleation, and minute incised spiral striation. Spire high-conic, the apex white or buff and typically sculptured. Whorls 6½, slightly convex, the last ascending in front, more or less strongly *compressed below the periphery, sloping flatly to a prominent, obtuse basal keel; excavated behind the columellar lip.* Suture but little impressed.

Aperture half the length of shell or more, subvertical, whitish and showing the external bands by transparence within, *becoming deep lilac* (or "intense reddish-violet") *toward the lip; peristome very broadly expanded*, reflexed, lilac with a white edge; columellar margin flaring, impressed and slightly grooved at its root, the outer edge nearly straight and obliquely sloping; columella with a convex fold far above, then concave in the middle or nearly straight, often convex again at base, or with an oblique tubercle there.

Alt. 37½, diam. 19; alt. of aperture 21 mill.

Alt. 40, diam. 19½; alt. of aperture 20½ mill.

Alt. 36½, diam. 17½; alt. of aperture 20 mill.

Alt. 39, diam. 19 mill. (Mousson for *violaceus*),

Alt. 44, diam. 20 mill. (Mousson for *eversus*).

Bogota (Wallis); *Marmato* (Bland), *U. S. of Colombia.*

Bulimus violaceus MOUSS., Malak. Bl., xxi, 1873, p. 9.—PFR., Novit. Conch., iv, p. 134, pl. 130, f, 5, 6.—*Bulimus eversus* MOUSS., l. c., p. 10.—PFR., l. c., p. 136, pl. 130, f. 9, 10; Monogr., viii, p. 50.

Especially notable for the strong, blunt basal keel, the whorl being flattened and tapering around it, and the umbilical region excavated and large. The broadly flaring lip is white at the edge, but becomes deep lilac within, but the parietal wall retains the color of the exterior, bearing a mere transparent film.

Mousson considered *eversus* (pl. 39, figs. 48, 49) distinct from *violaceus* in being more fusiform with less convex whorls, longer aperture, and more sharply defined coloration of waved and zig-zag streaks. These differences fail in the series before me collected by Bland at Marmato (pl. 35, figs. 26–29, 32). From specimens with a few straight color-streaks there is a full series of transitions to those with numerous zig-zag markings; and even interrupted spiral bands are sometimes developed (figs. 27, 32).

D. CONFLUENS (Pfeiffer).

Shell compressed umbilicate, oblong acuminate, rather thin, impressed punctate; whitish, painted with red [*spadiceis*] angular, white-dotted streaks, somewhat confluent to form bands; spire long conic, rather acute. Whorls 6½, a trifle convex, the last subequal to the spire, strongly compressed at base; columella arcuately emerging, bearing a nodule at the base. Aperture slightly oblique, rhombic-oval, subangular at base, lilac-red inside; peristome broadly expanded throughout, spreading, the right margin somewhat sinuous. Alt. 40, diam. 14 mill.; aperture 18 mill. long inside, 10 wide (*Pfr.*).

Marmato, U. S. of Colombia.

Bulimus confluens PFR., P. Z. S., 1855, p. 115; Monographia, iv, p. 443.

Seems somewhat like the preceding species.

D. BARANGUILLANUS (Pfeiffer). Pl. 35, figs. 21, 22.

Shell compressed umbilicate, ovate pyramidal, rather thin, striatulate, slightly shining; buff whitish, irregularly marked with nearly straight, narrow tawny stripes. Spire long conic, rather acute; suture shallow, whorls 7, rather flat, the last longer than the spire, convex, somewhat ascending in front, subcompressed at base, having a bluish streak behind the outer lip, a reddish border within; columella slightly arcuate, subplicate above. Aperture ample, vertical, elliptical-oval; peristome white, thin, dilated, the right margin expanded, columellar margin broadly reflexed. Alt. 32, diam. 13½ mill.; length of aperture 18, width 12 mill. (*Pfr.*).

Baranguilla, Colombian Andes (Bld.).

Bulimus baranguillanus PFR., P. Z. S., 1852, p. 136; Conchyl. Cab., p. 246, pl. 66, f. 5, 6; Monogr., iii, p. 334.

The only Barranguilla known to me in Colombia is at the mouth of the Magdalena River.

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D. FLEXUOSUS (Pfeiffer). Pl. 35, figs. 23, 24, 25.

Shell compressed umbilicate, *oblong turrited*, solid. White or nearly so, with *conspicuously festooned black or blackish-brown longitudinal stripes, which are dotted or lineolate with white*, and at the angles of the festoons coalescent more or less, forming three continuous or interrupted spiral bands; and with a continuous dark band at the verge of the umbilicus. Surface shining, smooth. Spire long, the apex white, typically sculptured. Whorls nearly 7, convex, the last not compressed at base.

Aperture half the total length or less, somewhat oblique, ovate, rose-purple or whitish and faintly showing the external pattern within; peristome broadly expanded throughout, white, becoming rose-purple within; the columellar margin reflexed; columella with a strong spiral fold above.

Alt. 41, diam. 18–19; alt. of aperture 19½–20 mill.

Alt. 32, diam. 14½; alt. of aperture, 17 mill.

Marmato, U. S. of Colombia (Bland).

Bulimus flexuosus PFR., P. Z. S., 1852, p. 136; Conchyl. Cab., p. 244, pl. 65, f. 6, 7; Monogr., iii, p. 329.—*Bulimus linostoma* BLAND in Adams' Contrib. to Conch., No. 11, p. 230. Not *B. linostoma* Orb.

The elaborate dotting or lineolation of the festooned stripes, as in *D. interpictus* and *glaucostoma*, is a prominent feature. The elongation of the spire, broadly spreading lip, the purple mouth and umbilical crescent are also tolerably prominent and constant characters. Bland called small specimens collected by him at Marmato "*B. linostoma*;" but they intergrade in size with the large typical form, also before me from the same locality.

D. MEMBIELINUS (Crosse). Pl. 50, figs. 90, 91; pl. 34, figs. 15, 16.

Shell narrowly perforate, ovate elongate, rather thin, longitudinally impressed with obsolete, inconspicuous somewhat wrinkle-like striæ; rather shining; whitish, ornamented with a blackish-chestnut, subinterrupted transverse band dotted with white, and rather wide, zig-zag and sometimes confluent tawny chestnut longitudinal streaks, similarly white-dotted. Spire long conic, the apex a little acute, suture simple. Whorls 6½, convex, the embryonic 2 whitish, the penultimate convexly inflated, the last whorl slightly ascending, a little longer than the spire, slightly elongated, somewhat tapering at base.

Aperture vertical, somewhat wide, subovate, livid white within, the streaks showing through; peristome simple, orange-fulvous, expanded and a little reflexed throughout, the columellar margin with a slight twist or fold; right margin buff-whitish near the outer edge. Alt. 36, diam. 15 mill.; aperture 18 mill. long, 12½ wide (*Crosse*).

Napo, Ecuador (Martinez).

Bulimus membielinus CROSSE, Journ. de Conchyl., xv, 1867, p. 445; 1868, p. 99, pl. 1, f. 2.—PFR., Monogr., vi, p. 39.—HIDALGO, Journ. de Conch., 1870, p. 47; Viaje al Pacifico, p. 72, pl. 4, f. 6, 7.

Compared with *D. glaucostoma* Alb. by Crosse, on account of the white punctulation; but it is probably more nearly allied to the white dotted species of the same region.

D. HIDALGOI (daCosta). Pl. 50, fig. 84.

Shell ovate-fusiform, compressedly umbilicate, rather thick; whorls 7, convex, smooth or with spiral incised lines under the lens; suture impressed. White, streaked longitudinally with blue-black. Columella a little twisted and reflexed; outer lip expanded and reflexed, margins joined by a purplish callus. Alt. 39, diam. 13, length of aperture with peristome 18, width 12 mill. (*da Costa*).

Ecuador.

Bulimulus (*Drymæus*) *Hidalgoi* DACOSTA, Proc. Malac. Soc. London, iii, p. 81, pl. 6, f. 2 (July, 1898).

This species bears a resemblance to both *B. felix* Pfr. and *B. membielinus* Crosse, but differs from each in form and sculpture. (*da Costa*).

D. SIGNIFER (Pfeiffer).

Shell perforate, subfusiform-oblong, thin, closely and lightly plicate-striate; whitish, irregularly marked with reddish serrate streaks. Spire inflated conic, rather acute. Whorls 6, the upper a little flattened, the penultimate convex, last whorl about as long as the spire, attenuated at base. Columella twisted, receding. Aperture scarcely oblique, oblong; peristome simple, the right margin rather widely expanded, columellar margin dilated, abruptly reflexed, broad. Alt. 33, diam. 13½ mill.; aperture 18 mill. long, inside 7 wide (*Pfr.*).

Venezuela? (Cuming Coll.).

Bulimus signifer PFR., Proc. Zool. Soc. Lond., 1855, p. 8; Monogr., iv, p. 393.

Similar to *B. yungasensis* Orb. or *papyraceus* Mawe (*Pfr.*). It has not been figured.

D. FELIX (Peiffer). Pl. 35, fig. 20.

Shell compressed umbilicate, ovate-oblong, thin, smooth; whitish or flesh colored, ornamented with reddish streaks or wide bands, dotted with white; spire convex conic, the acute apex blackish. Whorls 6, a little convex, the last about as long as the spire, somewhat ascending in front, attenuated at base. Columella somewhat twisted, receding, brownish-purple.

Aperture subvertical, oval, violet edged inside; peristome simple, white, the margins joined by a chestnut callus, right margin widely expanded. Columellar margin broadly reflexed. Alt. 33, diam. 13 mill.; aperture with peristome 17½ mill. long, 12 wide (*Pfr.*),

United States of Colombia (Cuming Coll.), *road from Llanos of St. Martin*, and low land and in forest at Lebonday, 2,100 meters alt. (Stübel).

Bulimus felix PFR., P. Z. S., 1861, p. 387, pl. 37, f. 2; Monogr. vi, p. 36.—*Otostomus* (*Drymæus*) *felix* MARTENS, Conch. Mittheil., p. 160.

Pfeiffer describes a variety, shell more slender, whitish, with sparse streaks of pale brown; alt. 35, diam. 11½, aperture with peristome 18½ mill. long, 11½ wide. Von Martens considers *B. elegantissimus* Mousson a synonym of *B. felix*.

D. ELEGANTISSIMUS (Mousson). Pl. 40, figs. 12, 13.

Shell narrowly umbilicate or perforate, long ovate, striatulate; shining; whitish, very elegantly decorated with waved blackish-brown flammules interrupted by white lines and dots. Spire long, convex-conic, regular, the apex minute, white; suture lightly impressed, sublinear. Whorls 7, equably increasing, a little convex, the last somewhat oblique, slightly ascending in front, slender, rounded at base, a trifle compressed at the brown perforation.

Aperture subvertical (5° from the axis), shorter than the spire, regularly oval, angular above, violaceous-brown within on the palatal and parietal walls; peristome expanded, slightly reflexed, subacute, white; right and basal margins regularly curved; columellar margin proceeding from the columella which is oblique and pliciform far

within, reflexed, adnate above, half closing the perforation, obliquely descending. Alt. 37, diam. 16 mill. (*Mouss.*).

Bogota (G. Wallis).

Bulimus elegantissimus Mouss. in Malak. Bl., xxi, 1873, p. 11.—Pfr., Novit. Conch., iv, p. 128. t. 129, f. 3, 4; Monogr., viii, p. 47.

Considered identical with *D. felix* by von Martens.

D. ziczac (daCosta). Pl. 50, fig. 92.

Shell ovate, conic, rather thin, umbilicate, the base subangularly produced. Buff, conspicuously waved with blackish-brown. Whorls 6, convex, minutely striated under the lens; columella flatly reflexed. Aperture ample, effuse, violaceous-purple inside; outer lip reflexed. Alt. 28, diam. 15, length of aperture with peristome 15, width 11 mill. (*da Costa*).

Valley of the Cauca River, Colombia.

Bulimulus (*Drymœus*) *ziczac* daCosta, Proc. Malac. Soc. London, iii, p. 81, pl. 6, f. 5 (July, 1898).

The color markings remind one somewhat of those on *B. undulatus* Guild., from the Island of St. Vincent, but its form is distinct. (*da Costa*).

D. andai Jousseaume.

Shell perforate, long-fusiform, solid, smooth, shining; white, striped with longitudinal wide, black, flexuous, irregularly angular spots. Spire lengthened, acuminate. Aperture ear-shaped, white, black-spotted; peristome white, expanded, depressed in front and behind; columella white, straight anteriorly, twisted posteriorly. Alt. 45, diam. 7·5 mill.; aperture 20 mill. long, 10 wide. (*Jouss.*).

Tena, Ecuador (Eudora Anda).

Drymœus Andai Jouss., Le Naturaliste, xx, Jan., 1898, p. 14.

I have seen this species labelled *B. membielinus* Crosse in collections, but for the detection of such an error, a glance at the figure of that species is sufficient. (*Jouss.*).

D. bogotensis (Pfeiffer). Pl. 35, figs. 17, 18, 19.

Shell narrowly perforate, oblong, moderately solid. White with brown or blackish vertical festooned streaks, with oblong spots at the angles of the streaks, forming three interrupted spiral bands on the body-whorl; glossy, showing under the lens very minute, superficial spiral striation, and with some low wrinkles of growth; apex

obtuse, sometimes black-tipped, typically sculptured. Whorls 6½ to 7, slightly convex, the last oblong, somewhat ascending at aperture.

Aperture about half the alt., ovate, colored within like the exterior; peristome broadly expanded throughout, reflexed, with a wide white border, within which it is deep purple; columellar margin rather narrowly reflexed, white-edged. Columella brown or purple, with a long fold above; parietal wall dark brown.

Alt. 31½, diam. 14½, alt. of aperture 16 mill. (Specimen).

Alt. 38, alt. of aperture 20 mill. (*Pfr.*).

Alt. 29, diam. 14 mill. (Specimen).

U. S. of Columbia: Bogota (Pfr.); *between Salamina and Cabuyal, west of Ervé* (Bland).

Bulimus spectatus Rve., Conch. Icon., f. 601b.—Bland in Adams' Contrib. to Conch. no. 11, p. 230.—*Bulimus bogotensis* Pfr., P. Z. S. 1855, p. 93; Monogr., iv, p. 390.

Evidently allied to *spectatus* Rve., from which it differs in coloration and the proportionately smaller aperture.

D. spectatus (Reeve). Pl. 40, fig. 14.

Shell fusiformly ovate, scarcely umbilicated, rather thin. Whorls 6 to 7 in number, longitudinally somewhat rudely, finely striated; columella reflected, rather depressed. Aperture ovate, lip peculiarly effused. Whitish or ash-brown, variously streaked or banded; columella and interior of the aperture rose-purple. (*Rve.*).

Alt. 40, diam. 18½; alt. of aperture 22 mill. (from fig.).

Road between Popayan to the Hacienda Sotara, United States of Colombia, at about 2400 meters alt. (Stübel).

Bulimus spectatus Rve., Conch. Icon., pl. 81, f. 601a (only; the other figures excluded).—*Otostomus* (*Drymœus*) *spectatus* Martens, Conchol. Mittheil., p. 160.

Reeve's figure 601*b* is *D. bogotensis* Pfr.; his fig. 601*c* is *D. gracilis* Lea=*leai* Pilsbry.

D. leai Pilsbry, n. n. Pl. 40, figs. 16, 17 (type), 15.

Shell oblong-fusiform, narrowly rimate-umbilicate, thin; white with three spiral bands of purple-brown blotches formed by the local intensification of longitudinal undulating streaks, which are only rather faintly seen and in places are obsolete. Spire rather straightly conic, the apex a little obtuse. Whorls 6½, almost flat, the last gently convex, subascending in front.

Aperture oblong-ovate, a trifle oblique, inside spotted and vermiculate-striated with brown; outer lip regularly arcuate, narrowly expanded above, becoming broadly so below, white with an internal border of faint pinkish-purple; columellar lip vertical, subsinuous, broadly dilated; columella pink-purple passing above into a long, convex fold; parietal wall with a thin purplish film. Alt. 34.3, diam. 15; alt. of aperture 18 mill.

Near Carthagena, U. S. of Colombia (J. H. Gibbon).

Bulimus gracilis Lea, Trans. Amer. Philos. Soc., vi, p. 85, pl. 23, f. 102 (June 15, 1838; see Proc. Amer. Philos. Soc., i, 1838, p. 19); Obs. Gen. Unio ii, p. 85, pl. 23, f. 102.—Pfr., Monogr., ii, p. 104. Not *Bulimus gracilis* Lea, Proc. Amer. Philos. Soc., i, p. 173 (March 20, 1840). Not *Bulimus gracilis* Hutton, Journ. Asiatic Soc. Bengal, iii, p. 93 (1834).

Figures 16, 17, represent the type, 105,154 U.S. Nat. Mus., from which the above description is taken. Reeve's fig. 601c, "*B. spectatus*," is, in my opinion, a rather highly colored example of *gracilis* see fig. 15. The vaulted space behind the columellar lip is about 1½ mill. wide.

D. dacostæ (Sowerby). Pl. 43, figs. 77, 78.

Shell narrowly but profoundly umbilicated, elongated, shining, irregularly striated; pale tawny flesh-colored, with wavy longitudinal streaks and two girdles of small black-brown spots. Spire convex-conic, the apex acute; suture lightly impressed. Whorls 6, little convex, the last about as long as the spire, attenuated at base; columella oblique, reflexed. Aperture subvertical, roseate within, showing the spots through; peristome simple, slightly reflexed. Alt. 26, diam. 11 mill. (*Sowb.*).

Bogota, U. S. of Colombia (Da Costa coll.).

Bulimulus da-Costæ G. B. Sowerby, P. Z. S., 1892, p. 297, pl. 23, f. 15, 16.

I have as yet seen only a single specimen of this species, which may be found to vary as much as the last (*koppeli*). It seems however to be distinct from any hitherto known. (*G. B. S.*).

D. murrinus (Reeve). Pl. 40, figs. 10, 11.

Shell fusiformly ovate, scarcely umbilicate, whorls 6, convex, smooth, polished, last whorl somewhat produced and attenuated at the base. Aperture rather oblong, slightly sinuated at the lower

part; lip expanded, scarcely reflected. Whitish, longitudinally streaked and transversely banded with livid olive or blue-black; interior of the aperture rich purple, lip white. (*Reeve*).

Alt. 37, diam. 14, alt. of aperture 19 mill. (from fig.).

Alt. 36, diam. 14, alt. of aperture 18 mill. (from fig.).

Santa Fé de Bogota, Colombia (coll. J. Dennison).

Bulimus murrinus REEVE, Conch. Icon., pl. 43, f. 273a, b (October, 1848).—PFR., Monogr., iii, p. 374; iv, p. 443; vi, p. 78.—? *Bulimulus* (*Drymœus*) ? *murrinus* MARTENS, Mal. Bl., xiv, 1867, p. 142.

It is said by Reeve to be "nearest allied to the *B. linostoma* d'Orbigny." Von Martens has identified as *B. murrinus*, but with some doubt, a series of shells collected by Thamm in Peru on the Chanchamayo, a tributary of the Ucayali river, one of the head waters of the Amazon (see Malakozoologische Blätter, 1867, p. 142). He compares *convexus* Pfr., *cantatus* Rve., and *spectatus* Rve. (f. 601a).

Var. *phryne* (Pfeiffer).

Shell perforate, oblong-fusiform, rather thin, plicate-striate; buff, with red streaks mottled with whitish; spire long conic, the apex minute. Whorls 6½, a little convex, the last slightly shorter than the spire, the base compressed at the perforation. Columella subangularly arcuate. Aperture little oblique, subrhombic, rose-colored inside, showing the streaks through; peristome simple, unexpanded, the right margin reflexed, overhanging. Alt. 31, diam. 12 mill.; aperture 15 mill. long, 7 wide. (*Pfr.*).

Andes of Peru (Cuming coll.).

Bulimus phryne PFR., P. Z. S., 1862, p. 274; Monogr., vi, p. 120.

Mr. DaCosta states that this is not separable from *B. murrinus* Reeve.

Var. *convexus* (Pfeiffer).

Shell narrowly umbilicated, oblong-fusiform, rather solid, striate, shining; whitish, ornamented with *streaks of brown lineolate with white;* spire lengthened, rather acute. Whorls 7, convex, the last a little shorter than the spire, *compressed around the umbilicus.* Columella arcuate, with a nodule above its base.

Aperture oblique, *receding at base,* elliptical, *the base channelled, lilac-rose colored within;* peristome rather broadly expanded, the

columellar margin narrowly reflexed. Alt. 38, diam. 14 mill.; aperture inside 17 mill. long, 7½ wide (*Pfr.*).

U. S. of Colombia (Cuming Coll.).

Bulimus convexus PFR., P. Z. S., 1855, p. 116; *B.* (*Goniostomus*) *convexus* PFR., Mal. Bl., 1855, p. 150; Monogr., iv, p. 444.

A variety is smaller, tawny banded with brown. The species has not been figured, and Mr. daCosta considers it a synonym of *murrinus*.

D. ANTIOQUIENSIS (Pfeiffer).

Shell shortly and deeply rimate, ovate-pyramidal, rather solid, minutely malleated, a little shining; white ornamented with irregular, straight or angular pale violaceous streaks; spire long-conic, the apex buff, rather acute; whorls 6, a little convex, the last slightly longer than the spire, rounded; columella subplicate above, red (*rubella*). Aperture slightly oblique, obliquely truncate-oblong; peristome thin, pale yellow (*vitellinum*), broadly and subequally expanded throughout. Alt. 30, diam. 13 mill.; aperture, with peristome, 17 mill. long, 12 wide. (*Pfr.*).

Province of Antioquia, Colombia (Schlim).

Bulimus antioquiensis PFR., P. Z. S., 1854, p. 291; Monogr., iv, p. 395.

An unfigured species, described from Cuming's collection.

D. MULIEBRIS (Reeve). Pl. 34, fig. 11.

Shell acuminately oblong, umbilicated, rather thin; whorls 7 in number, somewhat rudely very finely striated; columella reflected; aperture ovate, lip simple. Whitish, longitudinally painted throughout with narrow brown streaks, which are here and there darker. (*Reeve*).

Shell compressed-umbilicate, acuminate-oblong, rather thin, irregularly striated, a little shining; whitish, ornamented with narrow tawny and chestnut streaks; spire elongated, the apex acute; whorls 6½, somewhat flattened, the last a little shorter than the spire, somewhat compressed at base. Aperture slightly oblique, oblong, colored within like the outside; peristome simple, thin, the margins subparallel, right margin straight, columellar margin buff, dilated, rather flattened. Alt. 30, diam. 11 mill.; aperture 14½ mill. long, 6½ wide. (*Pfr.*).

Andes of Colombia.

Bulimus muliebris REEVE, Conch. Icon., pl. 81, f. 598 (Dec., 1849).—PFR., Monogr., iii, p. 426; Conchyl. Cab., p. 92, pl. 31, f. 13, 14.

D. SUBEFFUSUS (Philippi). Pl. 48, figs. 43, 44.

Shell perforate, fusiform-turrited, rather thin, striatulate; whitish, ornamented with brown longitudinal lines. Spire conic, lengthened, rather acute. Whorls 7, a little convex, the last about three-fourths as long as the spire. Columella somewhat folded, then bent to the right; aperture ovate-oblong, angulate at base; peristome rather thin, the right margin narrowly expanded, columellar margin dilated, hardly covering the perforation. Alt. 40½, diam. 17½ mill.; aperture 19 mill. long, 9 wide. (*Phil.*).

Coyllorbamba, Huancayo, Peru (Raimondi).

Bulimus subeffusus PHIL., Malak. Bl., xvi, 1869, p. 36.—PFR., Novit. Conch., p. 468, pl. 102, f. 1, 2; Monogr., viii, p. 112.

Based by Philippi upon a single somewhat faded specimen, which in form of the shell and expansion of the lip resembled *B. zoographicus* Orb.; but the aperture is subangular at base, the lower part of the columella bent to the right, as in *B. hamadryas* Phil., and the color pattern is like that of *B. linostoma* Orb.

D. PEALIANUS (Lea). Pl. 41, fig. 26.

Shell ovately conical, imperforate, smooth, shining, ash-colored, rather thick, furnished with longitudinal purple spots; whorls 6. Aperture widened out, purple; outer lip acute, reflected. Length 1·1, diam. 0·4 inch. (*Lea*).

Near the Rapids of Angostura, Colombia (T. R. Peale).

Bulimus pealianus LEA, Trans. Amer. Philos. Soc., vi, p. 65, pl. 33, f. 105 (1838); Observations on the genus Unio, etc., ii, p. 65, pl. 23, f. 105.

During Mr. Peale's travels in Colombia he found a single specimen of this beautiful species, and I am indebted to his kindness for the privilege of describing it. In this individual the longitudinal spots are more numerous on the whorl next to the body whorl, there being none on that part near to the outer lip. (*Lea*).

The type of this species was placed by Peale in his Philadelphia Museum. It was lost either in the fire which destroyed a large portion of that collection, or at the final dispersal of the remainder.

The species is unknown in American collections. Pfeiffer has

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identified with it a shell in the Cuming collection, which he thus describes:

"Shell subimperforate, ovate-conic, rather thin and smooth, shining, whitish, painted with spaced purple-brown flames. Spire conic, rather acute; suture margined. Whorls 6, a little convex, the last longer than the spire, dilated basally; columella compressedly folded, strongly receding, white. Aperture subvertical, oval, wide at base, purple-bordered within; peristome thin, widely expanded. Alt. 21, diam, 11 mill.; aperture 16½ mill. long, 11 wide.". (Pl. 41, figs. 27, 28).

The identity of this with Lea's species is questionable.

D. LINOSTOMA (d'Orbigny). Pl. 36, figs. 41, 42.

Shell oblong, ventricose, very thin, diaphanous, smooth, glossy, and appearing entirely smooth to the naked eye, but under a strong lens showing very fine, ill-defined transverse lines; dirty white or slightly roseate, with wide and well spaced longitudinal flames of brownish-violet. Spire conic, quite short, obtuse at apex, composed of 5 wide, inflated whorls separated by a deep, smooth suture; the last whorl very large, more than half the total length.

Aperture violet within, passing into rose, large, oval, a little oblique, the peristome rose colored, much expanded and wide but not recurved; columella twisted, with a thick, prominent flange, leaving quite a distinct umbilicus behind it. Alt. 29, diam. 14 mill. (*Orb.*).

North of the Mission of Bibosi, prov. Santa Cruz de la Sierra, and other localities in Bolivia.

Helix linostoma ORB., Mag. de Zool., 1835, p. 19.—*Bulimus linostoma* ORB., Voy. Amér. Mérid., p. 314, pl. 40, f. 9–11.—REEVE, Conch. Icon., pl. 55, f. 613.—PFR., Monogr., ii, p. 35; iii, 334; iv, 392; Conchyl. Cab., p. 112, pl. 34, f. 11, 12.—*Bulimulus linostoma* BECK, Index, p. 63. Not *B. linostoma* Bland in Ad., Contrib. to Conch., No. 11. p. 230.

The Colombian shells identified with *linostoma* by Bland are *D. flexuosus; D. linostoma* is not known to occur in that country.

D. SERRATUS (Pfeiffer). Pl. 36, figs. 46, 47.

Shell perforate or rarely closed, ovate-conic, rather thin; white above the periphery with longitudinal purple-brown stripes, the continuity of which is interrupted in two places by sharp arrow-shaped zig-zags: the whorls of the spire with several spiral series of

brown spots; base lilac tinted, almost or entirely without markings. Surface glossy, smooth, under the lens showing fine but distinct spiral striation and slight growth lines. Spire short, conic, the apex rather obtuse, earlier 1¾ whorls corneous or blackish-tipped, with the usual *Drymæus* sculpture. Whorls 5¾ or 6, slightly convex, the last large, rather inflated, suddenly ascending in front.

Aperture large, decidedly oblique, purple tinted and showing the external markings within; peristome very broadly expanded, flaring, lilac-purple with paler outer edge; columella vertical, straight or slightly concave, the margin broadly reflexed above.

Alt. 24½, diam. 13 mill.; alt. of aperture 14 mill.

Alt. 22½, diam. 11 mill.; alt. of aperture 12½ mill.

Moyobamba, eastern Peru (Yates).

Bulimus serratus Pfr., P. Z. S., 1855, p. 94, pl. 31, f. 6; Novit. Conch., i, p. 66, pl. 18, f. 15, 16; Monogr., iv, p. 391.—*Bulimus meobambicus* Moricand MSS., according to Pfr.

The large, oblique aperture, greatly expanded outer lip and peculiar coloration of stripes abruptly terminating at the periphery, are the more prominent features of this species.

D. dacostianus Pilsbry, n. n. Pl. 50, fig. 87.

Shell ovate, thin, imperforate. Whorls 5, smooth, glossy, seen under the lens to have transverse impressed sculpture, the apical two whorls very delicately granulate. Pure white, longitudinally streaked with blackish-chestnut. Columella narrowly reflexed. Aperture ample, the outer lip simple, little expanded. Alt. 19, diam. 11 mill. (*da Costa*).

Ecuador (Buckley).

Bulimulus (*Drymæus*) *lucidus* daCosta, Proc. Mal. Soc. Lond., iii, p. 82, pl. 6, f. 4 (July, 1898). Not *Bulimus lucidus* Reeve, which is also a *Drymæus*.

D. baezensis (Hidalgo). Pl. 36, figs. 48, 49, 50, 51.

Shell narrowly umbilicated, fusiform-ovate, thin, shining, striatulate; white, with five yellow transverse bands maculated with brown; spire lengthened, rather acute; suture simple. Whorls 6, a little convex, rather rapidly increasing, the earliest two very minutely decussated (as seen under a lens), the last more convex, obliquely descending; columella little arcuate, scarcely folded. Aperture ovate, colored within like the outside, half the length of

the shell; peristome broadly expanded, scarcely reflexed, white, the terminations joined by a very thin callus, right margin regularly arcuate, columellar margin dilated, reflexed above, somewhat sinuous, half covering the umbilicus. Alt. 31, diam. 12 mill. (*Hidalgo*).

Baeza, Ecuador (Martinez).

Bulimus baezensis HIDALGO, Journ. de Conchyl., 1869, p. 189; 1870, p. 48, pl. 1, f. 3; Viaje al Pacifico, p. 75, pl. 7, f. 11, 12.

Very variable in color pattern. Hidalgo mentions the following variations: (1) Shell with bands and spots confluent (yellow, ornamented with subundulating brown streaks); (2) Pale yellow, banded with white at suture and umbilicus; (3) Uniform whitish.

D. ÆQUATORIANUS (Smith). Pl. 36, fig. 45.

Shell umbilicate, ovate acuminate, thin, very minutely spirally striated, and sculptured with growth-lines; buff-white longitudinally streaked with rather wide and somewhat lightning streaked zigzagged black-brown stripes. Spire conic, the apex rather acute; whorls 6, little convex, the last large, somewhat inflated, ascending a short distance in front.

Aperture oval, pale buff inside, with pellucid streaks, a little exceeding half the total alt. of the shell; peristome thin, broadly expanded, rose colored outside and within; columellar margin broadly reflexed. Alt. 26½, diam. 11; aperture 14½ mill. long, 9½ wide. (*Smith*).

Ecuador.

Bulimus (*Drymœus*) *œquatorianus* E. A. SMITH, P. Z. S., 1877, p. 363, pl. 39, f. 7.

The species here described has been confounded with *B. fucatus* of Reeve, and was so labelled in the Cumingian collection. The type of that species, with the majority of all the others described in the late Mr. Lombe Taylor's collection having been most liberally presented to the British Museum by Mrs. L. Taylor, has enabled me to compare the two forms; and certain differences are observable which appear sufficiently constant to distinguish them.

In the first place, Reeve's species is from New Grenada, and the present one from Ecuador. It is also larger than the former, has the body whorl more inflated, the aperture is longer than half the entire length of the shell, whereas it is less in *fucatus;* the peristome is more inflated, and the coloration is different. (*Smith*).

A specimen before me probably referable to *D. æquatorianus* as a variety is a smaller, less conic than Mr. Smith's figure, the longitudinal stripes are nearly regular instead of zig-zag. Whorls 5½; lip pink outside and within. Alt. 22, diam. 11, alt. of aperture 12⅔ mill. (See pl. 36, figs. 43, 44).

D. RECEDENS (Pfeiffer).

Shell compressed-umbilicate, ovate-subfusiform, thin, smooth; pale yellow painted with undulating, sub-interrupted brown streaks; spire exactly conical, apex acute; whorls 6, nearly flat, the last longer than the spire, receding and slightly attenuated at base; columella inflated, twisted. Aperture slightly oblique, oblong-oval, angular above; peristome thin, whitish, the right margin rather widely expanded, columellar margin reflexed, dilated above. Alt. 27, diam. 12 mill.; aperture 16 mill. long (*Pfr.*).

Moyobamba, Eastern Peru.

Bulimus recedens PFR., P. Z. S., 1863, p. 525; Monogr., vi, p. 37.

An unfigured species, said by Pfeiffer to be similar in form to *B. serratus*.

D. INCLINATUS (Pfeiffer). Pl. 35, fig. 33.

Shell scarcely perforate, fusiform-oblong, rather solid, striate and rugose, and sculptured with very fine spiral striæ, a little shining, whitish. Spire conic, rather acute; whorls 5½, a little convex, *the last two-thirds of the total length*, attenuated at base. Columella callous, rather straightly receding.

Aperture oblique, oval; peristome simple, the right margin much dilated below, expanded, *columellar margin sub-adnate*. Alt. 33–34, diam. 12 mill.; aperture 21 mill. long, 13 wide, including peristome (*Pfr.*).

U. S. of Colombia (Cuming Coll.).

Bulimus inclinatus PFR., P. Z. S., 1861, p. 387, pl. 37, f. 3; Monogr. vi, p. 41.

D. EURYSTOMUS (Philippi). Pl. 41, figs. 24, 25.

Shell narrowly perforate, oblong-subfusiform, striatulate, seen under the lens to be grooved with very delicate, distant, transverse lines; very thin, hyaline. Spire turrited-conic, rather obtuse; whorls 6, rather flat, the last longer than the spire, subangular in the middle ventrally, compressed around the perforation. Aperture ovate; columella compressed, lightly arcuate; peristome thin, re-

flexed, tawny-bordered outside and within; columellar margin little dilated. Alt. 27, diam. 15 mill.; aperture 16 mill. long, 9 wide (*Phil.*).

Chanchamayo, Peru (Raimondi).

Bulimus eurystomus PHIL., Malak. Bl., xiv, 1867, p. 68.—PFR., Novit. Conch., p. 343, pl. 81, f. 7, 8; Monogr., vi, p. 48.

D. SUBSIMILARIS Pilsbry, n. sp. Pl. 44, figs. 15, 16.

Shell imperforate, oblong-acuminate, slender, rather thin but moderately solid. Fleshy-white, with two spiral series of small brown spots on the spire, the spaces between spots white; dark stripes running downward from some of the spots on the last whorl. Surface glossy, with faint growth-wrinkles and almost effaced, minute, close, spiral striation. Spire long, a little convexly conic; apex corneous, rather obtuse. Whorls over 5½, moderately convex, the last tapering below.

Aperture long ovate, less than half the total length of shell, oblique, whitish and showing the spots within, becoming lilac-purple toward the lip; peristome expanded, white; columella cord-like, with a long fold above; parietal wall slightly purple-tinted. Alt. 23, diam. 9½, alt of aperture 11 mill.

Habitat uncertain, probably western Brazil or eastern Peru.

Much more slender than *D. similaris*, which it resembles in color-pattern and texture. In *subsimilaris* there are no longitudinal stripes on the spire, the aperture is far less ample, lilac within, and the columellar lip is completely appressed and adnate throughout. Described from one specimen which was in a tray with *D. serratus* Pfr., a species of widely different form.

Group of D. expansus.

D. EXPANSUS (Pfeiffer). Pl. 34, figs. 1–5.

Shell large, deeply and broadly compressed-rimate, ovate-conic, thin; whitish, brownish, or rose-tinted white, variously streaked and maculate with brown or purple-brown; somewhat glossy, *sculptured with raised, thread-like rib-striæ* on the last whorl and a half, showing under the lens more or less distinct traces of fine, incised spiral striation. Spire conic with straight lateral outlines, the apex rather obtuse, earlier 1½ whorls with typical *Drymæus* sculpture; whorls 6½, moderately convex, the last rotund, the broad base somewhat flattened, suture suddenly ascending behind the lip.

Aperture large, a little exceeding half the length of the shell, vertical, more or less deeply lilac colored and showing the external markings within; *peristome very broadly expanded throughout; columella strongly twisted*, obliquely truncate below, its margin very broadly, flatly dilated above, making an angle with body whorl at the insertion.

Alt. 42, diam. 22; alt. of aperture 23 mill.

Alt. 44, diam. 20; alt. of aperture 24 mill.

Upper Amazon drainage in eastern Peru: Huallaga (Sowb.); *Moyobamba* (Yates); *Pebas* (Castelnau); *Huancavelica* (Castelnau); *between Lamas and Tarapoto* (Phil., for *B. auris-ratti*). *Also, Canelos, Ecuador* (Almagro).

Bulinus pulchellus Sowb., Conch. Illustr., f. 91. Not *Bulimus pulchellus* Brod., P. Z. S., 1832, p. 106.—*Bulimus expansus* Pfr., Monogr., ii, p. 60; iii, p. 331; iv, p. 394; vi, p. 40.—Hidalgo, Journ. de Conch., 1870, p. 47; Viaje al Pacifico, p. 71.—Hupe in Castelnau, Anim. Nouv. ou rares Amér. du Sud, p. 42, pl. 6, f. 3.—Crosse, Journ. de Conch., 1871, p. 316.—*Bulimus iodostomus* Deville & Hupe, Revue Zool., 1850, p. 641, pl. 15, f. 2.—*Otostomus pulchellus* Dohrn, Jahrb. D. M. Ges., ix, 1882, p. 106.—*Bulimus auris-ratti* Phil., Malak. Bl., xiv, 1867, p. 69.—Pfr., Novit. Conch., p. 336, pl. 80, f. 10, 11.

The strong rib striation, short, full body-whorl, twisted columella and conspicuously expanded peristome are characteristic. The lilac or purple color of the aperture varies to a faint tint in some specimens; and the external markings are quite variable.

Dohrn mentions a short variety, alt. 33, diam. 25 mill.; and a specimen in Pfeiffer's collection is long and slender, alt. 30, diam. 17 mill. The broader examples have a sort of perforation at the end of the umbilical chink, but this is closed in the more slender shells.

Philippi's *B. auris-ratti* (pl. 34, figs. 3, 4) is referred to *expansus* as a synonym, by Dohrn. The figures show a more straightly conic spire with less convex whorls, but this may be a fault of the drawing. It comes from the region inhabited by *D. expansus*.

Var. VANATTAI n. v. Pl. 34, fig. 6.

Smaller than typical *D. expansus;* cream or brownish, becoming flesh-pink above, with longitudinal purple-brown maculæ and two more or less interrupted spiral girdles; sculpture of white, thread-

like rib-striæ with fine, faint spirals between them; apex light, or black tipped. Aperture vividly showing the external markings inside, the peristome lilac-pink, fading to white at the outer edge. Whorls 6; alt. 30, diam. 15, length of aperture 17 mill.

Possibly identical with Sowerby's *B. pulchellus var.*, Conch. Illustr., f. 92, but the specimens before me have a different color pattern.

D. SCITUS (H. Adams). Pl. 32, fig. 45.

Shell rimate-perforate, ovate-pyramidal, rather thin, irregularly somewhat wrinkled striate, and obsoletely decussated with minute spiral lines; buff-white, sparsely ornamented with interrupted brown bands and spots. Spire conic, the apex acute. Whorls 6, rather flat, the last a little longer than the spire; rotund, compressed at base, obtusely carinated around the perforation. Columella twisted. Aperture vertical, wide, rounded or ear-shaped, violet colored inside; peristome simple, broadly expanded throughout. Alt. 28, diam. 17 mill. (*H. Ad.*).

Eastern Peru (Bartlett).

Otostomus scitus H. AD., P. Z. S., 1866, p. 442, pl. 38, f. 5.—*Bulimus scitus* PFR., Monogr.. viii, p. 55.

Dohrn considers this a synonym of *D. expansus.*

D. BARTLETTI (H. Adams). Pl. 32, fig. 44.

Shell umbilicate, globose-conic, rather thin, irregularly striated and closely decussated with very minute spiral lines; whitish, painted with an interrupted, white dotted, chestnut band and brown flames. Spire conic, a little obtuse. Whorls 5, rather flattened, the last ventricose, ascending, a little longer than the spire, obtusely keeled at base. Aperture subvertical, oblique, suboval; peristome thin, broadly expanded throughout. Alt. 25, greatest diam. 26, least 18 mill. (*H. Ad.*).

Eastern Peru (E. Bartlett).

Otostomus bartletti H. AD., P. Z. S., 1866, p. 442, pl. 38, f. 4.

D. PROTRACTUS (Pfeiffer). Pl. 42, figs. 61, 62.

Shell deeply and widely rimate-perforate, oblong-pyramidal, rather thin, pale buff or almost white, uniform or with longitudinal light brown streaks, narrow and subobsolete on the body whorl, *the apex black;* surface somewhat shining, closely and rather *coarsely striated.* Spire long conic, the apex rather obtuse; whorls 6½, the

last perceptibly compressed above, very convex at the periphery, slightly ascending behind the lip.

Aperture ovate, vertical, half the length of shell, white or streaked with reddish within; peristome thin, white, the outer lip slightly expanded above, becoming broadly so below; columella nearly straight, its margin very broadly dilated above, making an angle or even slightly channeled at its junction with the body-whorl. Alt. 26, diam. 12½; alt. of aperture 12½–13 mill.

Moyobamba, eastern Peru (Yates).

Bulimus protractus PFR., P. Z. S., 1855, p. 94, pl. 31, f. 1; Novit. Conch., i, p. 66, pl. 18, f. 13, 14; Monogr., iv, p. 389; vi, p. 35.—*B. prostratus* SCHAUFUS in Pätel Catal., p. 81.

The black apex, rather coarse striation and peculiar columellar lip are its more prominent features, the latter being formed as in other members of this group of species, most of which are stouter shells than *protractus*.

Pfeiffer mentions a variety which is smaller, the last whorl subangular, right margin of the peristome slightly curved.

D. NIGROGULARIS (Dohrn). Pl. 42, figs. 56, 57, 58, 59.

Shell narrowly rimate or perforate, oblong-acuminate, spirally striatulate, a little wrinkled obliquely, shining, thin, semipellucid, pale yellowish or buff, uniform or streaked with chestnut; spire lengthened, the apex decussated, rather acute; suture simple. Whorls 7, a little convex, the last whorl about as long as the spire, somewhat compressed at base. Aperture little oblique, truncate-oblong, subeffuse, colored within like the outside, the parietal wall black; peristome citron tinted, thin, expanded, the margins approaching, joined by a thin callus, right margin moderately arcuate, basal margin somewhat receding, columellar margin vertical, triangularly dilated above. Alt. 29–34, diam. 13–15 mill. aperture 16–17 mill. long, 10–12 wide (*Dohrn*).

Juraty, prov. Pará, on the right bank of the Amazon River.

Otostomus nigrogularis DOHRN, Jahrb. D. Mal. Gesellsch., ix, 1882, p. 107, pl. 3, f. 10–13.

Belongs to the numerous group of very similar species like *B. geometricus* Pfr., *B. xanthostomus* Reeve (not Orb.), etc., but known from all of them by the black-calloused parietal wall. The variations in contour consist in the greater or less slenderness of the spire, and

the corresponding more or less lateral deviation of the aperture. (*Dohrn*).

D. PUNCTICULATUS (Pfeiffer).

Shell profoundly and compressedly umbilicate, ovate-conic, rather thin, smoothish, shining; whitish, with sparsely scattered pellucid dots. Spire long-conic, rather acute. Whorls 7, rather flat, the upper buff; last whorl shorter than the spire, ascending anteriorly, slightly compressed basally. Columella somewhat receding, lightly arcuate; aperture subvertical, oblong-oval; peristome simple, the right margin narrowly expanded, columellar margin very much dilated, somewhat flexuous. Alt. 29, diam. 12½ mill.; aperture with peristome 14 mill. long, 8⅔ wide. (*Pfr.*).

Bolivia (Cuming coll.).

Bulimus puncticulatus PFR., P. Z. S., 1856, p. 390; Monogr., iv, p. 404.

D. HAMADRYAS (Philippi). Pl. 41, figs. 32, 33.

Shell perforate, ovate-fusiform, very thin and very glossy; whitish, painted with angular red, white-clouded streaks. Whorls 6, rather flat, the last compressed and subangular basally, slightly longer than the spire. Aperture subtriangular, spreading, lilac-margined inside; columella slender, very short; peristome dilated, subreflexed; columellar lip very oblique, forming an angle with the outer lip, moderately dilated above, half covering the umbilical chink. Alt. 31½, oblique diam. 14 mill.; aperture nearly 17 mill. long, 9 wide (*Philippi*).

Chanchamayo, Peru (Raimondi).

Bulimus hamadryas PHIL., Malak. Bl., xiv, 1867, p. 68.—PFR., Novit. Conch., p. 341, pl. 81, f. 1, 2: Monogr., vi, p. 79.

The angular base recalls *D. fidaensis*, the coloring *D. expansus*. Philippi remarks upon the resemblance to *B. aurisratti*. "A distinct though rounded angulation encircles the umbilicus, terminating at the lower angle of the aperture. Embryonal whorls under a strong lens very finely decussated. Colors, especially of the aperture, almost as in *B. xanthostoma* Orb."

D. CRICHTONI (Broderip). Pl. 34, fig. 14.

Shell imperforate, ovate-turrited, the apex obtuse; longitudinally strongly rib-plicate; yellow, variegated with dull green. Whorls 6, a little convex, the last about as long as the spire; columella

somewhat twisted, vertical. Aperture oblong, sinuously effuse at base, reddish within; peristome thickened, broadly expanded, roseate, the terminations joined by a wide, deep rose colored callus; columellar margin receding, as though truncate, at base. Alt. 70, diam. 29 mill. (*Pfr.*).

Ambo, near Huanuco, Peru.

Bulimus crichtoni Brod., P. Z. S., 1836, p. 44.—Sowerby, Conch. Illustr., f. 60.—*Bulimus crichtoni* Reeve, Conch. Syst., ii, pl. 173, f. 4; Conch. Icon., pl. 39, f. 240.—Pfr., Monogr., ii, p. 28.—*Otostomus crichtoni* H. Adams, P. Z. S., 1866, p. 442.

"The apex of the shell under description, the only specimen I ever saw, is broken. It will be observed that the specimen is notched at the base, but I suspect that this arises from accidental distortion" (*Broderip*).

A second specimen, collected by Bartlett in eastern Peru, is reported by H. Adams. May be a *Porphyrobaphe*.

D. narcissus (Albers). Pl. 29, figs. 29, 30.

Shell profoundly and compressed umbilicate, turrited-oblong, rather solid and somewhat smooth, very minutely spirally striated under the lens, a little shining, chalky. Spire convex-turrited, the apex acute. Whorls 6½, the upper flat, latter two convex, the last shorter than the spire, somewhat roughened, ascending in front, somewhat compressed at base. Columella folded above.

Aperture subvertical, oblong, *purple-violaceous inside*; *peristome purple*, inwardly blackish, the right margin broadly expanded, columellar margin much dilated, separated from the preceding whorl by a groove at its insertion, sinuously spreading, a little reflexed. Alt. 36, diam. 14 mill.; aperture with peristome 18 mill. long, 12½ wide (*Pfr.*).

U. S. of Colombia.

Bulimus narcissus Albers, Malak. Bl., 1854, p. 217.—Pfr., Monogr., iv, p. 384; Novit. Conch., i, p. 33, pl. 9, f. 10, 11.

Somewhat like *Neopetræus vadum* Pils. in appearance, but that species has keeled upper whorls, no groove at root of the columella, no minute spiral striation, and a differently colored mouth and lip. Pfeiffer considers *narcissus* near to *D. lilacinus* Reeve.

D. excoriatus (Pfeiffer).

Shell openly umbilicated, ovate-acuminate, rather thin, striatulate, under the lens punctulate, not shining, flesh colored. Spire

conic, acute; whorls 6, a little convex, the last longer than the spire, somewhat inflated. Aperture slightly oblique, acuminate-oval; peristome thin, expanded, the margins nearly contiguous, joined by a thin callus, right margin dilated in the middle, columellar margin very much dilated. Alt. 39, diam. 19 mill.; aperture with peristome 23 mill. long, 16 wide (*Pfr.*).

Andes of Peru (Keppell, in Cuming coll.).

Bulimus excoriatus PFR., P. Z. S., 1854, p. 123; Monogr., iv, p. 395.

Group of D. strigatus.

D. STRIGATUS (Sowerby). Pl. 42, figs. 39–52.

Shell broadly and openly rimate, ovate-conic, moderately solid; white or light brown, unicolored or with continuous or interrupted bands, or oblique stripes or streaks. Shining, with slight growth-lines and very minute spiral impressed striæ, the latter generally subobsolete. Spire conic, varying a good deal in alt., apex obtuse, often black-tipped. Whorls 5½ to 6½, the earlier 1½ with minute typical *Drymæus* sculpture, the rest convex, last whorl well rounded, slightly ascending in front, *very convex below*, excavated around the umbilical chink.

Aperture short, oval, varying from distinctly to but slightly oblique, showing the external coloring within, but becoming purple-tinged toward the lip, *inside of which there is a purple streak; peristome white, rather flatly reflexed throughout, the terminations approaching; outer lip decidedly arcuate near its upper insertion*, columellar lip dilated.

Alt. 21½, diam. 12; alt. of aperture 10 mill.

Alt. 19, diam. 11; alt. of aperture 9½ mill.

Alt. 23½, diam. 11; alt. of aperture 11 mill.

Peru: Huallaga [river?] (Sowerby); *Maynas* (Acad. coll.); *Moyobamba* (Yates); *banks of Ucayali R.* (Orton).

Bulinus strigatus SOWERBY, Conch. Illustr., f. 95, 96.—*Bulimus strigatus* PFR., Monogr., ii, p. 601.—REEVE, Conch. Icon., pl. 83, f. 613 (not pl. 44, f. 280).—*Bulimus saccatus* PFR., P. Z. S., 1855, p. 94, pl. 31, f. 2; Novit. Conch., p. 65, pl. 18, f. 9–12; Monogr., iv, p. 385.—CROSSE, Journ. de Conch., 1871, p. 317.—DOHRN, Jahrb. d. D. M. Ges., 1882, p. 107 (unites *musivus* and *saccatus*).—*Bulimus musivus* PFR., P. Z. S., 1855, p. 95, pl. 31, f. 3; Novit. Conch., p. 65,

pl. 18, f. 7, 8; Monogr., iv, p. 392.—*Bulimulus* (*Drymœus*) *musicus* PAETEL, Catalog, p. 101.

Excessively variable in coloration.

Typical *strigatus* (figs. 39, 40) is boldly striped with blackish-brown, the stripes either comparatively straight or markedly zigzag. They never extend over the base of the shell. I do not see any differential characters between *strigatus* and *musivus* (figs. 42–45). A form with narrow brown stripes in place of the wide ones occurs.

Color-var. *purus* (fig. 41). Uniform white or with a single dark basal band; lip and columella purple within.

Color var. *saccatus* Pfr. (figs. 46–49). White or whitish with three interrupted spiral blackish bands, and often more or less oblique streaking.

It is altogether likely that *B. delphinæ* and *mariæ* of Moricand are forms of this species; the series before me includes specimens closely resembling Moricand's figure of the former. Only full collections can decide whether *delphinæ*, *cecileæ* and *mariæ* are really varieties in the true sense.

Var. DELPHINÆ (Moricand). Pl. 42, fig. 50.

Shell umbilicate, ovate-pyramidal, thin, lightly striatulate; roseate, unicolored or interruptedly banded or maculate with black; spire conic, obtuse; whorls 5½–6½, nearly flat, the suture impressed, last whorl about as long as the spire; columella straight. Aperture shaped as in the genus *Partula*, vertical, ovate-oblong, lilac-colored inside; peristome expanded, white, the right lip strongly curved above, expanded, white. Alt. 20–22, diam. 8–9 mill. (*Moric.*).

Tarapoto, Peru (Moric.); *on the way from Rio Mayo, a tributary of the Huallaga R., to Lamas, in a red sandstone region, n.-e. Peru* (Stübel).

Bulimus delphinæ MORIC., Rev. et Mag. de Zool. (2), x, 1858, p. 452, pl. 14, f. 3.—PFR., Monogr., vi, p. 37.—*Otostomus* (*Drymœus*) *delphinæ* Moric., MARTENS, Conchol. Mittheil., p. 160.

Moricand writes: This shell varies a little in form, which is more or less elongated, and in color-pattern. It is always rosy, shining, with the interior of the aperture of a more or less deep lilac. Sometimes instead of being entirely roseate, these are several brownish bands on the last whorl, not reaching to the suture, and other

shells have a black band formed of lance-head shaped or square spots, showing on the last whorl only, or sometimes on the last and next whorls; the band being as distinct inside as on the exterior.

Var. CECILEÆ (Moricand). Pl. 42, fig. 52.

Shell umbilicated, ovate-pyramidal, thin, translucid, shining; pale buff, with elegant longitudinal narrow tawny streaks. Whorls 6, a little convex, the last about as long as the spire, suture impressed; spire conic, acute. Aperture little oblique, oblong, with a very pale lilac border within; columella slightly arcuate; peristome thin, expanded, buff or white, not continuous. Alt. 22–17, diam. 10–7 mill. (*Moric.*).

Tarapoto, Peru (Moric.); *Juan Guerra, on the Huallaga river, n.-e. Peru* (Stübel).

Bulimus cecileæ MORIC., Rev. et Mag. de Zool., 1858, p. 452, pl. 14, f. 4.—PFR., Monogr., vi, p. 37.—*Otostomus* (*Drymæus*) *cecileæ* MARTENS, Conchol. Mitth., p. 160.

Var. MARIEANUS Pilsbry, n. n. Pl. 42, fig. 51.

Shell broadly umbilicated, ovate-pyramidal, thin, lightly striated, shining; tawny-black, the last whorl begirt with a white band. Whorls 6, nearly flat, encircling by a black band or longitudinally irregularly streaked with blackish. Columella lightly arcuate. Aperture slightly oblique, oval-oblong, blackish inside; peristome thin, expanded, dilated, white or buff. Alt. 24, diam. 9–10 mill. (*Moric.*).

Tarapoto, Peru (Moric.).

Bulimus mariæ MORICAND, Rev. et Mag. de Zool., 1858, p. 453, pl. 14, f. 5.—PFR., Monogr., vi, p. 38. Not *B. mariæ* Albers, 1850.

Probably another variety of *D. strigatus*, but it seems to have a color pattern not represented in the series of that species before me.

D. ARCUATOSTRIATUS (Pfeiffer). Pl. 41, fig. 31.

Shell deeply rimate, ovate-pyramidal, thin, closely arcuate-striate, shining, irregularly painted with wide gray-brown bands streakedly interrupted, and angular streaks. Spire a little convexly conic, the apex black, slightly obtuse. Whorls 6, moderately convex, the last about as long as the spire, somewhat ascending in front, base slightly attenuated. Columella slightly plicate, subvertical. Aperture a little oblique, obliquely truncate-oval; peristome thin, broadly

expanded, the right margin lightly arcuate, columellar margin vaulted, reflexed. Alt. 30, diam. 13 mill.; aperture with peristome 15½ mill. long, 10½ wide. (*Pfr.*).

Huallaga, Peru (Reeve).

Bulimus strigatus REEVE, Conch. Icon., pl. 44, f. 280. Not of Sowerby.—*Bulimus arcuato-striatus* PFR., P. Z. S., 1855, p. 95; Monogr., iv, p. 394.

Considered by Reeve to be specifically the same as Sowerby's *strigatus*, but Pfeiffer describes the Cumingian specimen as a distinct species.

D. TIGRINUS (daCosta). Pl. 50, fig. 88.

Shell pyramidal-oblong, thin, openly umbilicated; whorls 6, subinflated, transversely minutely incised-striate. Columella reflexed; lip simple, expanded, pellucid. White, painted longitudinally with brown lines and streaks. Aperture ovate. Length 21, diam. 10 mill. (*daCosta*).

Ecuador (Buckley's coll.).

Bulimulus (*Drymœus*) *tigrinus* DACOSTA; Proc. Malac. Soc. Lond., iii, p. 82, pl. 6, f. 6 (July, 1898).

Seems allied to *D. strigatus*, but in that species the incised spirals are more minute and irregular in occurrence than the above description would lead one to think was the case in *tigrinus;* and no mention is made by DaCosta of the purple interior of the lip, which is more or less conspicuous in *strigatus* and its varieties.

D. MELANOSCOLOPS (Dohrn). Pl. 42, figs. 53, 54, 55.

Shell shortly rimate, ovate-pyramidal, very thin, nearly smooth, with very fine growth striæ, somewhat pellucid; hyaline-whitish variously painted with brown; spire long-conic, the apex acute, black; suture linear. Whorls 6, the embryonic 2 very minutely decussated, the rest smooth, slightly convex, last whorl shorter than the spire, rounded, subcompressed at base, ascending a short distance in front. Aperture slightly oblique, truncate-oval, colored within like the outside; peristome whitish or pale orange, thin, expanded throughout, the margins approximating, columellar margin dilated. Alt. 20–21, diam. 9 mill.: aperture 9½ mill. long, 7 wide. (*Dohrn*).

Province of Para, Brazil, on the Tapajos river.

Otostomus melanoscolops DOHRN, Jahrb. D. M. Ges., ix, 1882, p. 108, pl. 3, f. 6–8.

The color-forms are: 1, dots and evanescent streaks of brown; 2, a broad basal brown band whence arise ascending streaks; 3, 5 spiral brown bands.

The black apex, or embryonic whorls are only present in a few closely allied species, especially *B. protractus* Pfr. and *B. mariæ* Moric. (= *B. strigatus* Pfr., Mon. iv, var. d), which are distinguishable by other features.

D. RECTILINEARIS (Pfeiffer.). Pl. 44, figs. 9, 10 and young shell, 11.

Shell profoundly rimate or subperforate, oblong-pyramidal, thin, very lightly striatulate, diaphanous; whitish with one to three reddish bands and two wide blackish basal bands, articulated with white. Spire long-conic, subrectilinear, with the apex orange and rather acute. Whorls 7 to 7½, rather flattened, the last nearly two-fifths the total length, rotund at base. Columella slightly receding. Aperture oblique, oval-elliptical; peristome thin, the right margin narrowly expanded; columella very much dilated above, somewhat vaulted. Alt. 22½–24, diam. 9½–10½ mill.; aperture 10 mill. long, 5½ wide. (*Pfr.*).

Peru: Moyobamba (Yates), *Tarapoto* (Spruce).

Bulimus rectilinearis PFR., P. Z. S., 1855, p. 96, pl. 31, f. 7 (not adult); Novit. Conch., iii, p. 414, pl. 94, f. 19, 20; Monogr., iv, p. 405; vi, 51; viii, p. 65.—*Otostomus rectilinearis* H. AD., P. Z. S., 1870, p. 375.

D. FIDÆNSIS (Moricand). Pl. 41, fig. 21.

Shell lengthened-oblong, subfusiform, umbilicate, with acute spire, very delicately and irregularly striate; pale buff, irregularly maculate and figured with chestnut. Whorls 7½, flat, regularly increasing. Aperture oblong-oval, oblique, subangular at base; lip somewhat expanded, slightly reflexed, white; pale violaceous inside. Alt. 30, diam. 11 mill. (*Moric.*).

Bahia, Brazil (Moricand).

Bulimus fidœnsis MORIC., Rev. et Mag. de Zool., 1858, p. 451, pl. 14, f. 1.—*Bulimus fidaensis* PFR., Monogr., vi, p. 79.

This Bulimus, which I think is very rare, is long, solid, of a dirty yellowish-white, smooth and polished, with some striæ of growth and other finer, irregular striæ visible only under a lens; it is speckled with brownish, irregularly scattered spots and dots. The violet color of the inside reappears outwardly, surrounding the umbilicus.

The oblique aperture is oval and ends below in a sort of obtuse beak; the right margin is a little expanded, the left is more so, and partly covers the umbilicus. (*Moricand*).

I have not seen this species, which may be an *Odontostomus* of the subgenus *Moricandia*.

D. GUEINZII (Pfeiffer).

Shell profoundly rimate, oblong-conic, thin, rather smooth, shining; whitish, ornamented with narrow brown streaks which are undulating toward the base. Spire conic, rather acute. Whorls 6, slightly convex, the last slightly shorter than the spire, somewhat attenuated basally, violaceous at the umbilical chink. Columella compressed, somewhat twisted, violaceous. Aperture slightly oblique, truncate oblong, lilac colored inside; peristome thin, the right margin strongly curved, broadly expanded, columellar margin broad. Alt. 23, diam. 10 mill.; aperture with peristome 11½ mill. long, inside 5½ wide. (*Pfr.*).

Moyobamba, Peru (Gueinzius in Cuming coll.).

Bulimus gueinzii PFR., P. Z. S., 1856, p. 330; Monogr., iv, p. 387. —*Otostomus* (*Leiostracus*) *gueinzii* H. AD., P. Z. S., 1870, p. 375.

D. SIMILARIS (Moricand). Pl. 42, fig. 60.

Shell deeply rimate-umbilicate, ovate-conic, rather thin; *white with longitudinal serrated brown streaks which do not extend over the base, leaving an immaculate umbilical tract, and terminate far short of the suture above, in a series of spots forming an narrow interrupted (or brown and white articulated) spiral band.* Glossy and smooth, showing an almost obsolete spiral striation under the lens. Spire conic the apex subobtuse, 1¾ earlier whorls with typical *Drymæus* sculpture. Whorls 5½ to nearly 6, slightly convex, the last a little ascending in front, convex below.

Aperture a little oblique, colored within like the outside, slightly exceeding half the length of the shell; peristome white, well expanded below, columella concave below, with a slight fold above, the edge reflexed, leaving an open but short umbilical chink.

Alt. 25, diam. 13½; length of aperture 13 mill.

Alt. 20⅔, diam. 10; length of aperture 10¾ mill.

Moyobamba, eastern Peru (Moric.).

Bulimus similaris MORICAND, Journ. de Conchyl., 1856, p. 177, pl. 6, f. 8.—PFR., Monogr., iv, p. 391.—*Otostomus similaris* H. ADAMS, P. Z. S., 1870, p. 375.

The color-pattern is very characteristic and seems unusually constant in this species.

D. FUCATUS Reeve. Pl. 42, figs. 63–65.

Shell perforate, ovate-acuminate, thin, smooth; buff or brownish, ornamented with distant, somewhat lightning-zigzag blackish-chestnut streaks. Spire conic, the apex rather acute: whorls 6, a little convex, the last about as long as the spire, somewhat compressed at base, and roseate. Aperture oval, subeffuse; peristome thin, broadly expanded, rose-colored [or white] outside and within, the columellar margin somewhat straightened, broadly reflexed above. Alt. 24, diam. 10 mill. Aperture (measured inside) 11 mill. long, 6 wide. (*Pfr.*).

Ecuador: Sebundoi (Reeve); *Mt. Nanegan* (Bourcier); *Lumaco* (Martinez); *Nanegal*, 1000–2000 meters alt.; *near San Florencio, and on the way to Manabe*, 1500 meters (Stübel).

Bulimus fucatus REEVE, Conch. Icon., pl. 83, f. 615.—PFR., Conchyl. Cab., p. 100, pl. 32, f. 9, 10; Monogr., iii, p. 330.—HIDALGO, Journ. de Conchyl., 1875, p. 131.—*Drymæus fucatus* DOHRN, Jahrb. D. M. Ges., vii, 1880, p. 88.—*Otostomus* (*Drymæus*) *fucatus* MARTENS, Conchol. Mittheil., p. 160; Biol. Centrali Amer., Moll., p. 251.

Somewhat allied to *D. similaris*. It has been erroneously attributed to Mexico and Colombia.

D. ÆSTIVUS (Pfeiffer).

Shell umbilicated, oblong-turrited, rather solid, irregularly striated, whitish; spire long, a little convexly conic, rather acute. Whorls 6, moderately convex, the last about three-sevenths the total alt., slightly attenuated at base. Columella somewhat receding. Aperture a little oblique, acuminate-oval; peristome thin, the right margin narrowly expanded, columellar margin dilated, vaulted, reflexed. Alt. 17, diam. 7⅓ mill.; aperture 7⅔ mill. long, 4 wide. (*Pfr.*).

Moyobamba, Peru (Gueinzius, in Cuming coll.).

Bulimus æstivus PFR., P. Z. S., 1856, p. 331; Monogr., iv, p. 409.

D. GEOMETRICUS (Pfeiffer). Pl. 43, figs. 82, 83, 84, 85, 86.

Shell rimate-umbilicate, ovate-turrited, solid. Color either (1) uniform white, or (2) white with festooned purplish streaks, more or less united by two or three spiral bands, or (3) with the streaks

obsolete on body-whorl, bands conspicuous, or (4) fawn colored with very indistinct, slightly darker bands and streaks, and several bands of square whitish spots. Surface very glossy, with slight growth-lines and very minute spiral impressed lines, often subobsolete in places. Spire straightly conic, the apex slightly obtuse, nepionic 2 whorls typically sculptured. Whorls 6½, slightly convex, the last a little ascending, somewhat obliquely or laterally produced, broadly rounded beneath.

Aperture decidedly less than half the total alt., subvertical, ovate, whitish within, becoming deep purple or pale yellow toward the lip; peristome broadly expanded throughout, white, its inner edge purple or yellow; columellar margin dilated, impressed at the root, then rather erect; columella purple, with a short spiral fold above.

Alt. 33½, diam. 18; alt. of aperture 16½ mill.

Magdalena valley (Pfr.); *Forests in the mountains below Ervé, on the road to Santa Ana* (Bland), among dead leaves.

Bulimus geometricus Pfr., Symbolæ, iii, p. 84; Monogr., ii, p. 59; vi, p. 34.—Reeve, Conch. Icon., pl. 44, f. 278.—Bland in Adams' Contrib. to Conchology, no. 11, p. 230.

Extremely variable in coloration, but constant in form. The base is broadly rounded and the aperture unusually lateral and rather short.

D. clarus (Pfeiffer).

Shell rimate-umbilicate, ovate-oblong, thin, smooth, shining, diaphanous; whitish under a fugaceous, slightly tawny cuticle. Spire elongated, convexly conic, rather obtuse. Whorls 5½, moderately convex, the last about three-sevenths the total length, rotund basally; columella lightly arcuate. Aperture oblique, truncate-oval; peristome thin, the margins converging, right margin narrowly expanded, columellar margin dilated, spreading. Alt. 16, diam. 7½ mill.; aperture 7½ mill. long, 4½ wide. (*Pfr.*).

Moyobamba, Peru (Gueinzius, in Cuming coll.).

Bulimus clarus Pfr., P. Z. S., 1856, p. 330; Monogr., iv, p. 406.

D. bucia ('Behn' Pfr.).

Shell narrowly umbilicate, ovate-conic, rather thin and smooth. Grayish-corneous, marked with wide opaque whitish and short chestnut streaks. Spire inflated-conic, acuminate. Whorls 7, the upper minute, last 3 very convex, the last whorl shorter than the spire,

rotund basally. Aperture oblique, angulate-oval; peristome thin, the right margin narrowly expanded, columellar margin dilated above. Alt. 21½, diam. 10⅔ mill.; aperture 10⅔ mill. long, 5⅔ wide. (*Pfr.*).

Brazil (Cuming coll.).

Bulimus bucia (Behn on label), Pfr., Malak. Bl., vi, 1859, p. 39; Monogr., vi, p. 52.

Group of D. orobœnus.

D. orobænus (Orbigny). Pl. 44, figs. 87, 88.

Shell oblong, subumbilicate, rather thin with irregular and rather wrinkle-like growth lines; uniform yellowish tawny, the apex paler. Spire long, with convex outlines, acuminate, the apex a little obtuse. Whorls 8, rounded, separated by a deep smooth suture. Aperture two-fifths the total length, oval, whitish rufous inside; the peristome very distinctly thickened, whitish; columella oblique, solid, flat. Alt. 40, diam. 16 mill. (*Orb.*).

Mt. Biscachal, near the village of Carcuata, at the eastern edge of the province of Yungas, Bolivia, on the northeastern slope of the eastern Cordillera, in a very moist wood, over 3000 meters elevation. (*Orb.*).

Helix orobœna Orb., Mag. de Zool., 1835, p. 17.—*Bulimus orobœnus* Orb., Voy., p. 293, pl. 39, f. 3, 4.—Pfr., Monogr., ii, p. 143; iii, p. 380.

Reeve's *B. cuzcoensis* is evidently closely allied.

D. cuzcoensis (Reeve). Pl. 44, fig. 89.

Shell deeply rimate, oblong-turrited, rather thin, irregularly striated, little shining; tawny-reddish. Spire convexly turrited, the apex acute; whorls 7, a trifle convex, the last shorter than the spire, subrotund at base. Columella obsoletely folded, somewhat receding. Aperture little oblique, irregularly oval; peristome simple, the right margin narrowly expanded, columellar margin much dilated, rugose, reflexed, rather flattened. Alt. 36, diam. 13; aperture, alt. 17 width 9 mill. (*Pfr.*).

"*Cuzco, Bolivia*" (W. Lobb).

Bulimus cuzcoensis Reeve, P. Z. S., 1849, p. 98; Conch. Icon., pl. 71, f. 514.—Pfr., Monogr., iii, p. 344.

Evidently allied to *D. orobœnus,* of which Pfeiffer thinks it may be a variety.

D. CYGNEUS (Philippi). Pl. 44, figs. 92, 93.

Shell broadly perforate, oblong-turrited, densely plicate-striate, decussated upon the upper part of the whorls by distant lines; white. Whorls 6 to 7, a little convex, the last scarcely as long as the spire. Aperture piriform-ovate; columella slightly twisted, compressed; peristome expanded, the columellar margin dilated, not closing the umbilicus. Largest specimen measures: Alt. 37, diam. 19 mill.; aperture, measured outside, alt. 19, width 12 mill. (*Phil.*).

"*Lomas de Supe,*" *Peru* (Raimondi).

Bulimus cygneus PHIL., Malak. Bl., xiv, 1867, p. 68.—PFR., Novit. Conch., p. 342, pl. 81, f. 3, 4; Monogr., vi, p. 57.

Pfeiffer cites the wrong figures in the Novitates Conchologicæ, both in text and on the plate; also in the Monographia.

Seems to be near *B. membranaceus* Phil., but the shell is more solid, the whorls more convex, columellar margin much longer, embryonal whorls very large, etc.

D. MEMBRANACEUS (Philippi). Pl. 44, figs. 90, 91.

Shell perforate, elongate, subconic, very thin, whitish-hyaline, smooth, under the lens transversely striate, shining. Whorls 7½ but little convex. Aperture semioval, patulous, shorter than the spire; peristome simply expanded, the right margin arcuate, left margin very broad, reflexed, with the umbilical fissure concealed. Alt. 15, diam. 8 lines. (*Phil.*).

Habitat unknown.

Bulimus membranaceus PHIL., Abbild. u. Beschreib. neuer oder wenig gekannter Conchylien, ii, p. 126 [22], *Bul.*, pl. 5, f. 2 (October, 1846).—PFR., Monogr., ii, p. 102; viii, p. 69 (excl. syn.). Not *B. membranaceus* REEVE, Conch. Icon., pl. 75, f. 544.—Not *Otostomus membranaceus* MARTENS, Binnenmoll. Venezuela's, p. 30. —? ? *Bulimulus membranaceus* BLD. & BINN., Amer. Journ. Conch. vii, 1872, p. 182.—*Conf.* Crosse and Fischer, Moll. Terr. Mex., p. 559, and E. von Martens, Biol. Centr.-Amer., Moll., pp. 223, 224.

"The contour is lengthened conic, and reminds one of *B. pœcilus* Orb. and the like. The whorls are very little convex, smooth and glossy, under the lens with finely scratched transverse [spiral] lines, and at the suture fine little folds of the growth-striæ. The aperture comprises about three-sevenths the entire length; the peristome is

simple, outwardly expanded, finally reflexed, so that the left [columellar] portion forms a very broad plate over the umbilical chink. The entire shell is uncommonly thin, transparent, glassy and whitish." (*Phil.*).

The locality was unknown to Philippi. Pfeiffer, in Monogr., vi, p. 57, gives Pacific provinces of Mexico, upon whose authority does not appear. Von Martens in 1873 recorded a specimen in Albers' collection from Caracas, Venezuela; but later he decided that certain specimens from Mirador in eastern Mexico, fulfilled the requirements of Philippi's diagnosis (see under *D. emeus*). I am disposed to believe that Philippi's shell is distinct from *emeus*, and possibly a Peruvian *Drymœus* allied to *cygneus* and its allies.

D. PRÆTEXTUS (Reeve). Pl. 44, fig. 94.

Shell umbilicate, conic-oblong, rather solid, rugulose-striate, little shining; flesh-whitish, marbled with violaceous-brown streaks. Spire convex-turrited, the apex rather acute, tawny; suture lightly impressed. Whorls 8, slightly convex, the last a little shorter than the spire, tapering around the somewhat compressed umbilicus.

Aperture subvertical, oblong, narrow; peristome simple, the right margin lightly arcuate, narrowly expanded; columellar margin much dilated, reflexed, vaulted. Alt. 39, diam. 14, alt. of aperture 18 mill. (*Pfr.*).

Andes of Caxamarca, Peru (W. Lobb).

Bulimus prætextus RVE., P. Z. S., 1849, p. 98; Conch. Icon., pl. 71, f. 515.—PFR., Monogr., iii, p. 344.

A delicate blue-clouded shell, sprinkled with a few white lines, which are irregularly waved, and sometimes ramified like veins. (*Rve.*).

Group of D. fallax.

=*Semiclausaria* PFEIFFER, Malak. Blätt., 1855, p.162, type *B. subsemiclausus.*

D. SUBSEMICLAUSUS (Petit). Pl. 28, fig. 15.

Shell imperforate, ovate-acute, thin, striatulate; white, with scattered diaphanous dots and a tawny apex. Spire conic, rather acute; whorls 5, somewhat convex, the last as long as the spire, ventricose, sack-like below.

Aperture oblong, partly closed, the peristome simple, the right and basal margins angularly bent inward, parietal wall with a

brown callus; columella short and straight. Alt. 22, diam. 12, aperture 11 mill. long. (*Pfr.*).

Province of Bogota, Colombia, (Goudot, Wallis).

Bulimus subsemiclausus PETIT, Revue Zool., 1843, p. 239; Guerin's Mag. de Zool., 1843, pl. 66.—PFR., Monogr., ii, p. 170.—REEVE, Conch. Icon., pl. 41, f. 254.—MOUSSON, Mal. Bl., xxi, p. 12.—*B.* (*Semiclausaria*) *subsemiclausus* PFR., Mal. Bl., 1855, p. 162.

Mousson correctly locates this species next to *D. fallax* Pfr. Petit's original figure shows a white shell with orange apex and orange-brown parietal wall. Reeve figures a specimen with several spiral bands.

D. RABUTI (Jousseaume). Pl. 33, fig. 47.

Shell scarcely rimate, obliquely ovate-triangular, rather solid, ornamented with slight striæ, strong at the aperture; ivory or buff white, densely variegated with red spots; spire conic, the apex somewhat acute; whorls 5, a little convex, the last ample, swollen, somewhat inflated. Aperture ovate-subtriangular; peristome expanded, black-lipped within. Alt. 25, greatest diam. 18, least 13 mill., length of aperture 12, width 9 mill. (*Jouss.*).

Tena, Ecuador (Cousin).

Hamadryas rabuti JOUSS., Le Naturaliste, xx, Jan., 1898, p. 14, figs. in text.

D. FALLAX (Pfeiffer). Pl. 33, figs. 43, 44; pl. 28, figs. 8, 9, 10.

Shell subperforate, ovate-conic thin, bluish-white with some opaque white clouds, becoming generally diffused behind the peristome, and with an opaque white subsutural margin (or yellow with a white sutural line, or whitish with spots and longitudinal lines of fawn). Smoothish, under a lens finely wrinkled and pitted; shining. Spire short. Whorls 5½–6, slightly convex, the last large, inflated, obliquely produced, *becoming conspicuously keeled at the base* a short distance behind the lip, the keel projecting, bounded by a furrow above; *base at first inflated, then becoming flattened and radially plicate* behind the basal lip.

Aperture subvertical, *subtriangular;* peristome narrowly but distinctly expanded, thickened within, white or rose-bordered, produced and angular at junction of outer and basal margins; baso-columellar

lip reflexed; columella short, thin, vertical; *parietal wall covered by a rose colored callus.*

Alt. 26, diam. 16; alt. of aperture 14 mill. (Specimen).

Alt. 25, diam. 12½ mill. (Gld., *B. lautus*).

Alt. 24, diam. 12; alt. of aperture 12 mill. (Pfr., *B. fallax*).

Equador, at Tunguragua (Bourcier), *Quito* (Couthouy, Paz and Martinez), *Nanegal* (Stübel), *Tumbaco* (Bœtzkes), *Esmeraldas* (Moritz Wagner), *Hacienda of Schiquilpe,* on a ridge ramifying from the volcano of Pichincha, and along the *road between Aloag and Chones, Canton of Mégia* (Cousin).

Bulimus fallax PFR., P. Z. S., 1852, p. 156; Conchyl. Cab., p. 98, pl. 32, f. 5, 6; Monogr., iii, p. 375; viii, p. 113.—HIDALGO, Journ. de Conchyl., 1870, p. 50; Mol. Viaje al Pacif., p. 77.—*Otostomus (Drymœus?) fallax* MARTENS, Conch. Mittheil., p. 161.—*Goniostomus fallax* MILLER, Malak. Blätt., xxv, p. 191.—*Hamadryas fallax* COUSIN, Bull. Soc. Zool. France, 1887, p. 218.—*Bulimus lautus* GOULD, Proc. Bost. Soc. N. H. vi, p. 11 (Oct. 1856); Otia Conch. p. 219.—PFR., Monogr. vi, p. 77.

The shell is sometimes perforate, sometimes closed. The peristome varies greatly, being more or less strongly thickened within and expanded, sometimes rose-red, sometimes entirely white, and either with no denticle near the basal angle, or with one or two distinct ones. Miller distinguishes two varieties: var. *minor*, right margin of lip toothless, the entire peristome rose colored; 6 whorls. Alt. 21-22, diam. 10, aperture 10 x 6 mill. Var. *major*, peristome white, broadly expanded below in the angle, impressed externally on both sides, the right margin with two teeth within, left margin strongly plicate opposite the teeth; 5½ whorls. Alt. 27, diam. 12, aperture 13½ x 7 mill. Plain of Tumbaco, 3 hours journey eastward from Quito, 2600 meters above sea level, (500 below Quito).

Figures 8, 9, 10 on pl. 28 represent a specimen like Gould's *lautus* except that it has only a very faint rose border within the outer lip, while *lautus* is described as "peritremate albo, rosaceo vivide submarginato." Figs. 43, 44, pl. 33, are Pfeiffer's type of *fallax*, which is small, red-lipped, generally with a lip-tubercle and but slight basal plication.

D. ABSCISSUS (Pfeiffer). Pl. 50, fig. 89.

Shell subimperforate, pyramidal, rather solid, rugulose-striate, opaque, whitish; spire long-conic, rather acute. Whorls 6½, a little

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convex, the last slightly shorter than the spire, rectangularly carinated at base, as if cut off. Columella arcuate.

Aperture little oblique, rhomboid-oval, rose colored within: peristome slightly expanded, purple, margins joined by a purple callus the columellar margin reflexed, subadnate. Alt. 28, diam. 13; alt. of aperture 13½ mill., width 7½. (*Pfr.*).

Quito (Cuming coll.).

Bulimus abscissus PFR., P. Z. S., 1855, p. 116; Monogr., iv, p. 376.—*Goniostomus abscissus* Miller, Malak. Bl. xxv, 1873, p. 192; and (n. F.) i, pl. 6, f. 5.—*Hamadryas abscissus* COUSIN, Bull. Soc. Zool. Fr. 1887, xii, p. 219.

This species would seem to be allied to *D. fallax* or *D. nystianus*. The figure is from Miller.

D. BOURCIERI (Pfeiffer). Pl. 33, figs. 45, 46.

Shell imperforate, ovate, moderately solid; opaque white with wide longitudinal flesh-brown clouds and darker spiral lines (or "fleshy-gray variegated with darker"); somewhat shining. Sculpture: *numerous unequal, irregularly spaced spiral grooves* intersecting closer wrinkles of growth, the spirals becoming obsolete on the earlier whorls. Spire conic, apex slightly obtuse. Whorls 5½, but slightly convex, separated by crenulated sutures, the latter half of the last whorl *bluntly but conspicuously angular below*, the base flattened.

Aperture decidedly over half the total length, ovate, subvertical, whitish with zigzag brown streaks within, peristome narrowly expanded, outer margin regularly arcuate, white or rose colored; columella concave, slightly folded above, its edge reflexed and appressed at the umbilical position, passing into a thin rose-colored parietal callus.

Alt. 24, diam. 13; alt. of aperture 12·8 mill.

Pichincha, Ecuador (Bourcier).

Bulimus bourcieri PFR., P. Z. S., 1852, p. 153; Monogr., iii, p. 314; Conchyl. Cab., p. 98, pl. 32, f. 3, 4.—*Bulimus* (*Thaumastus*) *bourcieri* ALB., Die Hel., p. 215.—*Otostomus* (*Hamadryas*) *bourcieri* ADS., Gen. Rec. Moll., ii, p. 150.—*Goniostomus bourcieri* MILLER, Mal. Bl., xxv, p. 192, 1878.—*Hamadryas bourcieri* COUSIN, Bull. Soc. Zool. France, 1887, p. 219.

Similar to *D. fallax* in the basal angulation, though it is far less accentuated in this species. The spirally grooved surface is characteristic.

Group of D. koppeli.

D. KOPPELI (Sowerby). Vol. XII, Pl. 6, figs. 1, 2, 3, 4.

Shell imperforate, ovate-conic, thin, shining; fleshy-whitish or buff straw-colored, generally with small black-brown spots promiscuously scattered over the surface; the apex flesh colored. Spire acutely conic; whorls 6, a little convex, very lightly, irregularly striated; suture lightly impressed; the last whorl rather swollen, nearly half the length of shell, rounded at base. Aperture suboval, slightly oblique, rather wide, whitish inside, showing the external spots through; peristome thin, rose-edged; the lip terminations joined by a very thin callus. Alt. 25, diam: 15 mill. (*Sowb.*).

Bogota.

Bulimulus koppeli SOWB., P. Z. S., 1892, p. 297, pl. 23, f. 9–12.—PACE, Proc. Malac. Soc. Lond., i, p. 230, f. viii, ix (genitalia), x (teeth).

Seems to be allied to *D. gabbi* Angas and *D. tripictus* Albers, of Costa Rica. The anatomy is typical for the genus. Mr. Sowerby writes: A pretty little shell, varying considerably in form and color, but the lip appears to be always thin and prettily edged with red. Of the two specimens lent me for description by Mr. DaCosta, one is nearly white, profusely sprinkled with small brown spots, while the other is of a yellowish straw color (more decided yellow towards the apex), with only a few pale spots. I have as yet only seen very few specimens, but these exhibit considerable variation in their proportions. One apparently abnormally inflated specimen measures nearly 15 millimetres in width and only about 20 in length; while the narrowest specimen measures scarcely more than 11 millimetres in width to 21 in height. (*Sowerby*).

Group of D. bivittatus.

D. BIVITTATUS (Sowerby). Pl. 28, figs. 11, 12.

Shell pyramidally ovate, oblique towards the base, umbilicated; whorls 8 in number, smooth, peculiarly crenulated at the sutures. Aperture obliquely ovate; lip and columella broadly reflected and effused. White, last whorl faintly two-banded with chestnut (*Rve.*). Alt. 29, diam. 16, alt. of aperture 15 mill. (from fig.).

Brazil.

Bulinus bivittatus Sowb., Conch. Illustr., f. 46.—*Bulimulus bivittatus* Beck, Index, p. 65 (1837).—*Bulimus bivittatus* Rve., Conch. Icon., pl. 81, f. 597.—Pfr., Monogr., ii, p. 62; vi, p. 81.—*Otostomus bivittatus* Ads., Genera, iii, p. 149.

"Effused in an oblique direction, after the manner of the *B. aurisleporis*." (*Rve.*).

Var. *flexilabris* Pfr. Pl. 28, figs. 13, 14.

In the single specimen before me the spire of slightly over 7 convex whorls is touched with ruddy at the apex; the first two whorls show the sculpture of the genus, and the last whorl has three spiral brown zones, which are overlaid with a whitish coat, as if frosted, with scattered dots of the dark color. The bands are only faintly visible within the mouth. Surface smooth and glossy, with the faintest traces of incised spirals in places. The sutural crenulation is developed, though less strongly than in typical *bivittatus*. It was overlooked by my artist. Aperture oblique, slightly less than half the alt. of shell; the white lip produced in a broad lobe at the basal outer margin. Alt. 25, diam. 13, alt. of aperture 12·3 mill. It is said to be from the Amazon River.

This I identify with Pfeiffer's unfigured *B. flexilabris*, the original diagnosis of which here follows: "Shell shortly rimate-subperforate, obliquely ovate-turrited, rather solid, nearly smooth, shining, white, with 3 reddish, white dotted bands. Spire high-conic, the apex rather obtuse and black. Whorls 7, a little convex, the last shorter than the spire, obliquely produced, the base subangulate in front. Columella short and twisted, receding. Aperture a little oblique, irregularly subquadrangular; peristome simple, expanded throughout, the right margin straight in the middle, curved above, at base subimpressed and angularly dilated outwards, left margin sloping, forming an angle with the columella, much dilated above. Alt. 28, diam. 12½ mill.; aperture inside 11½ mill. long, 7 wide" (*Pfr.*, P. Z. S., 1853, p. 50; Monogr., iii, p. 652). Brazil, Cuming collection.

D. quadrifasciatus (Angas). Pl. 41, figs. 22, 23.

Shell elongately ovate, rimate, moderately solid, shining, finely longitudinally striated; white, transversely banded with light brown, the last whorl with four bands, the central one being the widest. Spire conical, apex obtuse; whorls 6, somewhat convex.

Aperture oval, equal to the spire; outer lip flattened and expanded at the base. Alt. 1 inch 3 lines, diam. 6½ lines. (*Angas*).

Ecuador.

Bulimus (*Otostomus*) *quadrifasciatus* ANGAS, P. Z. S., 1878, p. 312, pl. 18, f. 2, 3.

D. NAPO (Angas). Pl. 41, figs. 19, 20.

Shell rimate, ovately fusiform, moderately solid, shining, very finely and irregularly striated; pale fawn color with a narrow white band next below the suture and a similar white band surrounding the perforation. Spire sharply conical, somewhat obtuse at the apex. Whorls 6, slightly convex; aperture ovate, same length as the spire; outer lip expanded and flattened at the base, white behind, bordered by a narrow suffused orange band. Alt. 1 inch 3 lines, diam. 5½ lines. (*Angas*).

Ecuador.

Bulimus (*Otostomus*) *napo* ANGAS, P. Z. S., 1878, p. 312, pl. 18, f. 4, 5.

Group of D. bolivianus.

D. BOLIVIANUS (Pfeiffer). Pl. 43, fig. 66.

Shell perforate, oblong-turrited, decussated by most minute impressed lines, visible under a lens, shining; whitish-red, ornamented with somewhat interrupted wide brown bands; spire turrited, the apex acute, red. Whorls 7, flat, the last a little convex, about four-ninths the total length of shell. Columella with a twisted fold, rose colored. Aperture oval-oblong, colored within like the outside; peristome simple, the right margin narrowly expanded, columellar margin much dilated, reflexed, excavated, nearly closing the chink-like perforation. Alt. 33, diam. 13 mill.; aperture 16 mill. long, 7½ wide. (*Pfr.*).

"*Merida, Bolivian Andes.*"

Bulimus bolivianus PFR., P. Z. S., 1846, p. 34; Monogr., ii, p. 105.—REEVE, Conch. Icon., pl. 81, f. 599.

D. SUBINTERRUPTUS (Pfeiffer). Pl. 41, figs. 34, 35.

Shell perforate, subfusiform-oblong, rather thin, smooth, seen to be spirally striated under the lens, a little shining; whitish, with five wide, somewhat interrupted light reddish bands. Spire long-conic, acute; suture but little impressed. Whorls 6, rather flat, the

last a little longer than the spire, attenuated basally. Columella somewhat straightened, receding. Aperture oblique, narrow, acuminate-semioval; peristome simple, thin, buff, the right margin broadly expanded; columellar margin triangularly dilated from the base, broadly reflexed above. Alt. 37, diam. 13½ mill.; aperture 20 mill long. (*Pfr.*).

Bolivian Andes (Pfr.); *Moyobamba region, eastern Peru* (Stübel).

Bulimus subinterruptus PFR., P. Z. S., 1851, p. 256; Conchyl. Cab., p. 80, pl. 21, f. 20, 21, and *var.*, f. 22, 23; Monogr., iii, p. 333. —*Otostomus* (*Drymœus*) *subinterruptus* MARTENS, Conchol. Mittheil., p. 160.

Pfeiffer refers to this species, as a variety, a form (pl. 41, figs. 29 30) which is smaller, with wider aperture, the columellar margin less receding, more narrowly reflexed. It is probably an imperfectly developed shell.

D. LÆTUS (Reeve). Pl. 43, fig. 72.

Shell perforate, conic-oblong, rather thin, smoothish, shining; reddish, with longitudinal pale lines and three buff-white bands; spire conic, a little obtuse. Whorls 5½, slightly convex, the last a little shorter than the spire, rotund at base; columella plicate above, arcuate, roseate. Aperture slightly oblique, oval; peristome thin, roseate, the right margin slightly arcuate, columellar margin reflexed, dilated above. Alt. 25, diam. 11 mill., aperture (measured inside) 12 mill. long, 6⅔ wide in the middle. (*Pfr.*).

Sebundoi, northern Ecuador (Cuming coll.); *Pasto, southern Colombia* (Lehmann).

Bulimus lætus REEVE, Conch. Icon., pl. 83, f. 616 (Dec., 1849). —PFR., Monogr., iii, p. 343.—DUNKER, Jahrb. D. Mal. Ges., 1882, ix, p. 380.—*Drymœus lætus* DOHRN, Jahrb. D. Mal. Ges., vii, p. 88.

D. TRIVITTATUS (Mousson). Pl. 43, figs. 67, 68.

Shell subperforate, ovate-fusiform, rather solid, striatulate, irregularly malleated, shining; white, with three wide brown-black bands, the upper one interrupted or ragged. Spire long, conic, regular; apex small, white; suture little impressed, sublinear. Whorls 6½, a little convex, showing two bands; the last whorl gently ascending a little in front, lengthened, expanded toward the margin, tapering below, rounded at the region of the perforation.

Aperture vertical (5° from the axis), as long as the spire, long-oval, angular above, receding below and widely effuse, white, with the bands showing through ; peristome expanded, subacute, white ; outer margin arcuately dilated ; basal broadly retracted, columellar narrowly reflexed above and appressed, then a little produced forward ; columella obliquely twisted. Alt. 33, diam. 16 mill. (*Mouss.*).

Bogota (Wallis).

Bulimus trivittatus Mouss., Malak. Bl., xxi, 1873, p. 11.—Pfr., Novit. Conch., iv, p. 133, pl. 130, f. 3, 4 ; Monogr., viii, p. 53.

This species approaches *B. convexus* Pfr., but the form is more compact and stronger, the surface has only weak striation, instead of irregular malleation and no trace of spiral lines. The last whorl adjacent to the covered perforation is not compressed ; the axis forms a prolonged fold, passing toward the columellar margin, etc. The coloration consists of three broad black bands, the upper one interrupted and ragged, instead of brown streaks.

D. tribalteatus (Reeve). Pl. 43, fig. 71.

Shell somewhat fusiformly ovate, slightly umbilicated ; whorls 6, convex, smooth or minutely longitudinally striated. Aperture rather small, lip slightly reflected ; pale straw color, conspicuously belted with three chestnut zones ; lip bright pink (*Rve.*). Alt. 24, diam. 11 mill. ; alt. of aperture 12 mill. (from fig.).

Santa Fé de Bogota (Dennison coll.).

Bulimus tribalteatus Rve., Conch. Icon., pl. 43, f. 269 (October, 1848).—Pfr., Monogr., iii, p. 342.—Dkr., Jahrb. D. M. Ges., 1882, p. 380.

Lehmann collected a form, referred by Dunker to this species, in woods at Santiago, southern Colombia. It is white with roseate lip and corneous apex, but without the chestnut bands.

D. studeri (Pfeiffer). Pl. 43, fig. 69.

Shell perforate, oblong-conic, rather thin, striatulate, decussated by close spiral lines, visible only under a lens, shining ; white, ornamented with 3 or 4 narrow rose colored girdles. Spire conic, acute ; whorls 6, a trifle convex, the last about four-ninths the length of the shell ; columella arcuate. Aperture oval-elliptical, colored within like the outside ; peristome simple, the margins somewhat converging, right margin narrowly expanded, columellar margin

vaultingly reflexed, roseate. Alt. 25, diam. 10 mill.; aperture 11½ mill. long. (*Pfr.*).

Merida, Colombia [Venezuela] (Cuming coll.).

Bulimus studeri PFR., P. Z. S., 1846, p. 112; Monogr., ii, p. 107; iii, p. 347; iv, p. 412; vi, p. 57.—REEVE, Conch. Icon., pl. 57, f. 384.—*Bulimus primula* REEVE, t. c., f. 385 (Dec., 1848).

"The two pink bands which encircle this shell upon a shining white ground are very characteristic" (*Rve.*).

Pfeiffer refers Reeve's *B. primula* to *studeri* as a variety It is thus described:

B. primula (pl. 43, fig. 70) "shell oblong, somewhat cylindrical, umbilicated, whorls 6, smooth or obliquely finely striated, columella broadly reflected, lip simple. Whitish, here and there brightly colored with yellow, encircled with broad pink zones, apex purple-brown. Merida, New Granada. A prettily painted species from the same locality as the preceding [*studeri*], differing slightly but importantly in form. The whorls are somewhat more ventricose and the reflected portion of the columella more appressed" (*Rve.*).

D. SMITHII (daCosta). Pl. 50, fig. 1.

Shell cylindric-turrited, umbilicate: whorls 6, suture impressed, smooth; under a lens showing impressed transverse striæ, the striæ in the 2 earlier whorls finely granulate; last whorl obliquely produced. Livid brownish, irregularly banded and waved, ornamented with three purple-brown zones, the upper interrupted with purple, arrow-shaped spots; columella purplish. Aperture half the length of shell, obliquely ovate, outer lip pale buff, broadly reflexed. Alt. 29½, diam. 15 mill. (*da Costa*).

Bogota.

Bulimulus (*Drymœus*) *Smithii* DACOSTA, Proc. Malac. Soc. Lond., iii, p. 81, pl. 6, f. 8 (July, 1898).

Evidently near *D. blandi.*

D. CAUCAENSIS (daCosta). Pl. 50, fig. 85.

Shell fusiform-turrited, narrowly umbilicate, whitish, with three blackish interrupted, white-dotted zones. Whorls 6, convex, with impressed sutures, longitudinally plicate-striate. Columella little twisted and reflexed. Aperture ample, purplish, and two-banded with white inside; outer lip little reflexed, white; margins joined by a

purplish callus. Alt. 35, diam. 16, aperture with peristome 17 mill. long, 11 wide. (*da Costa*).

Valley of the Cauca River, Colombia

Bulimulus (*Drymœus*) *caucaensis* DACOSTA, Proc. Malac. Soc. Lond., iii, p. 81, pl. 6, f. 3 (July, 1898).

Very near forms I have referred to *D. blandi*, from Fresno and Antioquia, but with narrower lip, and plicate-striate instead of malleated surface. A comparison of *D. smithii*, *caucaensis* and *blandi*, with abundant material, might possibly cause their consolidation under the former name.

D. BLANDI Pilsbry, n. sp. Pl. 43, figs. 73, 74, 75 (types), 76, 79, 80 (var.).

Shell narrowly perforate or subperforate, obliquely oblong-acuminate, solid and opaque; white or nearly so, unicolored (fig. 75) or with irregularly spaced narrow, longitudinal brown or purple-brown streaks and two narrow spiral bands of the same color, becoming interrupted into arrow-shaped spots on the spire (fig. 74), or two or three bands without longitudinal streaks (fig. 73), or with other patterns (see below). Surface rather shining, with slight growth-wrinkles, a rather minute malleation which varies from conspicuous to subobsolete, and rather widely spaced, superficially engraved spiral lines, in some specimens scarcely to be detected. Spire rather straightly conic, apex somewhat obtuse with typical *Drymœus* sculpture. Whorls 6, slightly convex.

Aperture oblique, long-ovate, slightly over half the alt. of shell, broadly bordered within with dull brownish-purple which fades to white toward the outer edge of lip and in the throat; peristome broadly expanded, columellar margin narrowly expanded, reflexed and a little wider above; columella slightly concave, purple-brown; parietal callus dark purple-brown.

Alt. 30½, diam. 14½; alt. of aperture 15½ mill.

Alt. 26½, diam. 13; alt. of aperture 13 mill.

Near Fresno, Colombia (Bland).

A species excessively variable in color-pattern, but with the broad internal lip border, columellar edge and parietal wall constantly dull purple, much as in *D. geometricus*. It is evidently allied to *D. tribalteatus*, *studeri*, *smithii*, *caucaensis*, etc.

Figures 73–75 are from the types collected near Fresno. The aperture is more obliquely prolonged and narrow than in *D. smithii* and *D. caucaensis*.

Another specimen, also from Fresno, is probably referable to *blandi* as a variety, though it differs in the larger size (alt. 33, diam. 16, length of aperture 18 mill.), the more open umbilical chink and the color-pattern, which consists of longitudinal brown streaks speckled with white, and cut into spots by two or three spiral white zones. The lip is very broadly expanded. It has considerable resemblance to the figure of *D. caucaensis* da Costa, though the lip is broader and it is heavily plicate-striate. It is evidently the same as a specimen from Antioquia (pl. 43, fig. 76), in which the longitudinal streaks are stronger, not cut by white spiral zones, though the lower part of the base is white, and there are several ill-defined, dark spiral bands. This shell has much the color pattern of *D. murrinus* Reeve, but not the subangularly prolonged base of that species.

Fig. 79 is a variety with somewhat open umbilical chink, and light brown longitudinal streaks closely vermiculate-lineolate with white. It is said to be from Bogota. Another Bogota specimen (fig. 80) collected by Bland, has the umbilical chink wholly closed, and there are three faint girdles crossing the equally faint brownish longitudinal streaks. This shell measures: alt. 36, diam. 18, length of aperture 18 mill.

D. MALLEATUS (da Costa). Pl. 50, fig. 86

Shell ovate-conic, rather solid, slightly umbilicated. Whorls 5, the last crenate at the sutures, peculiarly corrugated, transversely obscurely striated. Columella callous. Aperture whitish within, oval, "*basi partim bisecta*," the margins joined by a buff callus, white, variedly streaked with ashy-brownish, the lip roseate. Alt. 34, diam. 15, length of the aperture, measured inside, 14, width 6 mill. (*da Costa*).

La Paz, Bolivia, altitude 3,600 meters.

Bulimulus (*Drymœus*) *malleatus* DA COSTA, Proc. Malac. Soc. Lond., iii, p. 82, pl. 6, fig. 7 (July, 1898).

A beautiful and interesting shell described from a single specimen. The curious malleation of the surface is very peculiar and unique, I believe, in shells belonging to this section (*da Costa*). I do not understand just what structure the author intends to be understood by the phrase "*Apertura . . basi partim bisecta.*"

Group of D. papyraceus.

Mormus ALBERS, Die Heliceen, 2d edit., p. 216 (1860), type *B. papyraceus* (Mawe).

A moderately well-defined group of *Drymæus* with thin, slightly expanded lip, variegated coloration of spots, blotches or imperfect bands, and usually coarse striæ or malleation. The species all occur in southern and eastern Brazil.

D. PAPYRACEUS (Mawe). Pl. 51, figs. 1, 2, 3.

Shell minutely perforate or imperforate, oblong-acute, thin, somewhat fragile. Opaque whitish, copiously *streaked* longitudinally *with black or blackish-brown, the streaks variegated with white longitudinal lines, and spreading at intervals into blotches* which form three interrupted girdles; *a sharply-defined umbilical patch always white.* Surface shining, coarsely and irregularly rib-striate, with slight traces of close spiral striation in places. Spire long-conic, with straight lateral outlines, the apex rather obtuse. Whorls 6½, moderately convex.

Aperture ovate, vividly showing the external markings; peristome thin, gently expanded along the outer and basal margins, outer lip very equably arcuate, columella vertical and *almost straight*, slightly folded above, pressed in at its junction with body-whorl, the edge narrowly reflexed, leaving a slight umbilical chink or none. Alt. 29–32, diam. 14; length of aperture 15 mill.

Brazil: Bahia (Paz) *Rio Janeiro* (Hensel, Paz, A. D. Brown *et al.*), *Taguara* (von Ihering). *Argentina*: *Prov. Corrientes* (Orb.); *San Pedro* (Borelli).

Helix papyracea MAWE, The Linnæan System of Conchology, p. 168, frontispiece, f. 7 (1823).—*Bulimus papyraceus* GRAY in Ann. of Philos. (n. ser.), ix, p. 414.—WOOD, Index Test., suppl., pl. 8, f. 76.—PFR., Monogr., ii, p. 102; iii, p. 337; iv, 399; vi, 46; viii, 57. —REEVE, C. Icon., pl. 39, f. 236.—CUNNINGHAM, Trans. Linn. Soc. Lond., xxvii, p. 483 (1870).—PARAVICINI, Boll. Mus. Zool. ed Anat. Comp. Torino, ix, no. 181, p. 6.—HIDALGO, Journ. de Conchyl., 1870, p. 57; Viaje al Pacifico, p. 108. Not *B. papyraceus* DROUET, Moll. Terr. et Fluv. Guyane Francaise, p. 60.—*Bulimulus papyraceus* BECK, Index Moll., p. 65.—CLESSIN, Malak. Bl. (n. F.), x, p. 166 (1888).—HEYNEMANN, Mal. Bl., xv, p. 110, pl. 5, f. 9 (jaw and teeth).—MARTENS, Mal. Bl., xv, p. 179 (1868).—ANCEY, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, xii, no. 309, p. 5.—*Otostomus* (*Mormus*) *papyraceus* SEMPER, Reisen in Archip. Phil., Landmoll., iii, p. 156, pl. 17, f. 7 (genitalia).—*Mormus papyraceus* DOERING, Bol. Acad. Nac. de Cien. Rep. Argent., iii, p. 77 (1879).

Helix (*Cochlogena*) *lita* Fer., Prodr., p. 54, no. 403 (name only); Voy. autour du Monde, exécuté sur les Corvettes de S. M. l'Uranie et la Physicienne, par M. Louis de Freycinet, Zool., p. 473, pl. 67, f. 10, 11 (1824).—Orb., Mag. de Zool., 1835, p. 11.—*Bulimus lita* Desh. in Lam. An. s. Vert., viii, p. 247; in Fér., Histoire, p. 89, pl. 139, f. 6, 7.—Pot. & Mich., Galerie, i, p. 159, pl. 15, f. 23, 24.—Orb., Voy. Amér. Mérid., p. 268.—Reeve, Conch. Icon., pl. 39, f. 236.—Not *B. lita* Troschel, Archiv für Naturg., 1849, i, p. 230, pl. 4, f. 3 (jaw and teeth), and in Schomburgk, Reisen in Britisch Guiana, iii, p. 547.

Bulimus lituratus Spix, Testacea Fluv. Bras., p. 7, pl. 7, f. 3.

Bulimulus papyraceus var. *latior* Martens, Strebel, Beitr. Mex. Land- und Süssw.-Conch., v, p. 81, pl. 13, f. 7; pl. 14, f. 7 a–e; pl. 16, f. 9, 10 (anatomy).

An abundant and variable species. The type locality of *papyraceus* is Rio Janeiro. Figs. 1, 3, are drawn from specimens collected there (in the suburb San Domingo) by A. D. Brown.

The locality of Ferussac's original *Helix lita* is not known. The first description is of specimens collected at or near Rio Janeiro by the naturalists of the Uranie and Physicienne; and these are typical *papyraceus*.

B. lituratus Spix (pl. 51, fig. 2) from the Northern Provinces of Brazil, is somewhat more boldly marked than the typical form, but has the same slender contour, with narrow, straight columella.

The locality *Guiana*, given by Drouet and Troschel, is based upon specimens collected by Schomburgk. In my opinion, these shells were either wrongly identified or else they did not really come from Guiana. I have elsewhere commented upon the obvious overloading of the Guiana snail fauna for which Drouet is responsible.

Von Martens briefly describes a variety, *c*, as larger, lengthened, reminding one of *B. prætextus* and *effeminatus* Rve., but more acuminate. Length 40, diam. 19, length of aperture 20 mill. It is from Costa da Serra.

According to Hidalgo, Paz obtained specimens at Rio Janeiro corresponding with Reeve's figure of "*B. litus*" (pl. 51, fig. 6). At Bahia, Paz and Martinez collected specimens agreeing with Reeve's figure of *papyraceus* (similar to pl. 51, fig. 3).

Orbigny writes. This species divides into two quite distinct varieties. The first [typical *papyraceus*], which is constantly elongated

and narrow, inhabits the littoral of Brazil, from the province of Rio Grande do Sul as far as Bahia and Pernambuco. The other [probably = var. *papyrifactus*], which is always shorter and is larger, with more open aperture, lives in the province of Corrientes and the Missions. We have found the first variety in 1826 in the environs of Rio Janeiro, and the second in the woods bordering the Parana, Rio-Batel, Rio Santa-Lucia, and on the Lake of Hera.

Var. PAPYRIFACTUS Pilsbry, n. v. Pl. 51, figs. 4, 5.

Conspicuously shorter and more inflated, the spire short, conic; whorls 5 to 5½, the last inflated, convex below. Aperture exceeding half the shell's length, the columellar reflection wider, not pressed in at its junction with the body-whorl, leaving a moderate umbilical fissure. Alt. 28, diam. 16½, length of aperture 17 mill.

Curitiba, prov. Parana, Brazil (H. von Ihering).

This form is probably identical with von Martens' var. *b*, which is described as more ventricose (length 30½, diam. 17, length of aperture 17 mill.), from Porto Alegre, prov. Rio Grande do Sul. It may be what Strebel calls "var. *latior* Martens;" but no information to substantiate this supposition has been published.

Just what relation *B. litus* Reeve, not Fér. (pl. 51, fig. 6), bears to var. *papyrifactus* I have not been able to ascertain, having no specimens like it. It has a longer spire.

D. POLYGRAMMUS (Moricand). Pl. 26, fig. 70.

Shell umbilicate, small, oblong-conic, thin; whitish marked with *numerous brown longitudinal streaks, which stop short of both suture and base, and are split into lines by the white longitudinal striæ, a basal white band, and a dark brown band revolving within the umbilicus.* Surface hardly shining, *very coarsely striated* with low, white striæ as wide as their intervals, no spiral striation. Spire long, rather thick, with slightly convex lateral outlines, the apex obtuse, with typical *Drymæus* sculpture. Whorls 6½, slightly convex, the last rounded at periphery, subcompressed below, somewhat angularly rounded at the verge of the rapidly contracting umbilical perforation.

Aperture small, ovate, but slightly oblique; brownish with a basal white band within; peristome thin, almost imperceptibly expanded, white, the columellar margin broadly dilated above, columella concave below, straight above.

Alt. 13½, diam. 6, length of aperture 5½ mill.

Forests of Caxoeira, prov. Bahia, Brazil (Blanchet).

Helix polygramma Moric., Mém. Soc. Phys. Hist. Nat. Genéve, vii, p. 436, pl. 2, f. 12–14 (1836).—*Bulimus polygrammus* Dh. in Lam., An. s. Vert., viii, p. 243.—Pfr., Monogr., ii, 106; iii, 424; iv, 485; vi, 132.—*Bulimulus polygrammus* Beck, Index, p. 64.

A much reduced member of the *D. papyraceus* group, easily distinguished by its diminutive size, coarse whitish striæ, with light basal band and dark umbilicus, and the rather stout spire. The apical sculpture is typical for *Drymæus*, but so minute that only a high magnification reveals it. One specimen before me wants the brown streaks and white basal zone, the opaque whitish striæ standing on a corneous ground. The only figures published, those of Moricand, are decidedly poor.

D. cuticula (Pfeiffer).

Shell perforate, ovate-fusiform, membranaceous, striatulate, scarcely shining, diaphanous; very pale corneous, dot-streaked with brownish, and dotted with snow-white. Spire conic, rather obtuse; suture minutely crenulated. Whorls 4½, a trifle convex, the last forming three-fifths the total length, encircled below the middle by a pale band, edged above with brown; the base tapering. Columella subplicate, receding; aperture little oblique, acuminate-oblong; peristome simple, unexpanded, the columellar margin shining, reflexed. Alt. 28, diam. 13 mill.; aperture 19 mill. long, 8 wide (*Pfr.*).

Rio, Brazil (Cuming coll.).

Bulimus cuticula Pfr., P. Z. S., 1855, p. 95; Monogr., iv, p. 450; Nomenclator Heliceorum Viventium, p. 232 (1878).

Known to me by the above description only. Pfeiffer places it in *Plectostylus*.

D. magus (Wagner). Pl. 51, figs. 7, 8.

Shell ovate-conic, subventricose, thin but solid, shining, longitudinally striated. Whorls 6, a little convex; spire elevated, acute, as long as the last whorl. Aperture ovate; lip simple, the left margin subreflexed, forming an extremely narrow umbilical chink; color buff, with wide, irregular, longitudinal brown streaks, the apex pale flesh colored. Aperture white, painted with brown streaks. Length 20, diam. 10 mill. (*Spix-Wagner*).

Provinces Piauhy and Maragnan [Maranhao?] *Brazil*, in woods.

Bulimus inflatus Spix, MS., not of Lamarck.—*Bulimus magus* Wagner, Testacea Fluv. Bras., p. 6, pl. 7, f. 1 (1827).

Commonly, but incorrectly, referred to *B. papyraceus* as a synonym. That *D. magus* belongs to the *papyraceus* group of species is evident from the similarly formed columella; but the smoother surface, compact form and heavy coloring are sufficiently distinctive differences. I have identified with Wagner's long-lost species a *Drymœus* sent me by Dr. H. von Ihering from Sao Paulo, which is described below. The wide separation of the localities is the only objection to be raised to this identification; but even this does not cause me to seriously doubt their specific identity.

Pl. 51, fig. 8. Shell narrowly perforate, ovate, of rather short, stout figure; thin; *cream-colored, heavily painted with longitudinal black stripes which abruptly terminate a short distance from the columella, leaving a nearly uniform pink circum-umbilical patch;* a line of the creamy ground tint below the sutures; the stripes becoming obsolete above, several *earlier whorls rose-colored.* Surface slightly shining, smooth to the naked eye, showing slight growth-wrinkles and faint, superficial spiral striæ under a strong lens; the apical $1\frac{3}{4}$ whorls with typical *Drymœus* sculpture. Spire short and stout, apex slightly obtuse; whorls $5\frac{1}{2}$, slightly convex, the last with a somewhat roseate streak behind the lip.

Aperture ovate, slightly exceeding half the total alt., conspicuously white and dark-brown striped within; peristome thin, a mere trifle expanded, pale-edged, with an inconspicuous roseate submargin; columella nearly straight, deeply entering, the edge reflexed, almost closing the narrow umbilical fissure. Alt. 23, diam. 13, alt. of aperture $12\frac{1}{2}$ mill.

D. HENSELII (v. Martens). Pl. 41, figs. 37, 38.

Shell perforate, ovate-turrited, irregularly striate and sculptured with very delicate, very close spiral lines; whitish, painted with brown streaks, which are confluent in the middle of each whorl. Apex obtuse, brownish. Whorls 6, rather flattened; suture irregularly undulating; last whorl little convex below.

Aperture subvertical, ovate-oblong, nearly half the length of the shell; peristome a little thickened, lightly spreading, white, the columellar margin dilated, not closing the perforation, expanded above in a parietal lamina. Columella itself twisted. Alt. 40, diam. 28 mill.; aperture 20 mill. long, 11 wide. (*Mart.*).

Costa da Serra, prov. Rio Grande do Sul, Brazil (Hensel).

Bulimulus henselii MARTENS, Malak. Bl., xv, 1868, p. 180.—*Bulimus henselii* PFR., Novit. Conch., p. 464, pl. 101, f. 14, 15; Monogr., viii, p. 44.

Reminds one somewhat of the large variety of *B. papyraceus*, but is widely diverse from that in the broad columellar margin. (*Mts.*).

D. ACERVATUS (Pfeiffer). Pl. 51, figs. 11, 12, 13.

Shell acutely oblong-ovate, umbilicate, thin. Color either (1) light buff with irregularly spaced brownish oblique streaks and copiously marked with numerous spiral series of dark spots and dots, or (2) dingy reddish-brown with streaks and fewer rows of dots, or (3) buff with bold spiral bands of black or black-brown, subcontinuous below, somewhat interrupted into vertical series of blotches above (var. *balteatus*). Surface slightly shining, irregularly wrinkle-striate, malleated in places, densely striated spirally, the striæ shallow, somewhat effaced in places on some specimens. Spire conic, the apex slightly obtuse, 1⅔ earlier whorls with typical *Drymæus* sculpture. Whorls 6 to 6½, slightly convex.

Aperture somewhat exceeding half the total altitude of shell, slightly oblique, irregularly ovate, acute above; outer lip thin, the edge slightly expanded; columella white, broadly dilated above, vaulted over the rather large and deep umbilicus.

Alt. 42, diam. 21½, length of aperture 22½ mill.

Alt. 36½, diam. 20, length of aperture 20 mill.

Southern Brazil: *prov. of Sao Paulo at Sorocaba and Botucatu; prov. Parana at Punta Grossa* (Dr. v. Ihering).

Bulimus acervatus PFR., Malak. Bl., iv, 1857, p. 157; Monogr., iv, p. 400.

This fine species has not before been figured. It was described from a unique specimen in the Cuming collection, with the locality "Brazil." The type measures: Alt. 41, diam. 21 mill.; aperture 23 mill. long, 12 wide inside, according to Pfeiffer.

Somewhat allied to *D. poecilus* in form, sculpture and in the coloration of the banded form, but the dotted form more closely resembles *Bulimulus punctulifer*. Besides the typical form (figs. 11, 12), and the banded form (v. *balteatus*, fig. 13), there is a dingy chestnut form with darker streaks, an ill-defined peripheral buff band interrupted by these streaks, a series of long light flammules below the suture, and sparcely scattered light dots with dark "shadows." This may be called var. *paucipunctus* (pl. 51, figs. 14,

15; pl. 50, fig. 77). The exact locality of this form is not known, but it is probably from the province of Sao Paulo. Alt. 36, diam. 20, length of aperture 20 mill. Another specimen (the one figured on pl. 51) is smaller. Alt. 33, diam. 18½, length of aperture 18½ mill. The latter is in U. S. Nat. Mus.

Group of D. glaucostomus.

D. GLAUCOSTOMUS (Albers). Pl. 39, figs. 46, 47.

Shell openly rimate-umbilicate, ovate-conic, solid; *white, with three blackish bands conspicuously dotted with white,* and usually connected at intervals by vertical streaks, the upper band often interrupted into spots. Shining, with slight growth lines and very *close, fine but distinct spiral incised lines.* Apex white with typical sculpture. Whorls 6, slightly convex, the last wide, convex, ascending in front, broadly rounded beneath.

Aperture large, white with three black bands inside; *peristome expanded, extremely broad, deep purple* with a white edge; columellar margin impressed and grooved at its root, then bending forward; columella with a short, convex spiral fold above. Alt. 33, diam. 19; alt. of aperture 19½ mill.

Venezuela: Mountains between Pto. Cabello and Valencia, 2000 ft. above the sea, on palm trees (C. F. Starke); *Cumbre del Valencia* (Simon).

Bulimus glaucostomus ALBERS, Zeitschr. f. Malak., 1852, p. 32.—PFR. in Conchyl. Cab., p. 153, pl. 48, f. 11, 12; Monogr., iii, p. 332. —*Otostomus glaucostomus* MARTENS, Binnenmoll. Venez., in Festschrift zur Feier des 100-Jährigen Bestehens der Ges. Naturf. Freunde zu Berlin, p. 181 (1873).—*Drymæus glaucostomus* JOUSSEAUME, Mém. Soc. Zool. de France, ii, 1889, p. 241.

A beautiful and very distinct species, quite constant in form and coloration.

Group of D. trigonostomus.

D. TRIGONOSTOMUS (Jonas). Pl. 39, figs. 34, 41, 42, 43, 44, 45.

Shell openly rimate-umbilicate, *fusiform,* moderately solid; whitish, (1) uniform or (2) with 4 or 5 spiral reddish-brown or purplish bands, or (3) with three bands of square spots above, two continuous bands below, or (4) fleshy-brown with darker oblique streaks. Surface shining, smooth, with light growth-lines, and fine spiral incised

striæ which are usually weak, subobsolete or wanting. Whorls 6½ to 7, but slightly convex, the last *strongly compressed beneath, pinched into an obtuse, prominent basal keel;* umbilical area excavated.

Aperture half the length of shell or less, *angular above and at base*, banded or uniform within; peristome broadly expanded, generally yellow or pink with a white edge, and often bordered within by a dark stripe; columellar lip obliquely sloping, straightened, columellar fold weak or inconspicuous.

Alt. 36, diam. 15; alt. of aperture 18 mill.

Alt. 28, diam. 13; alt. of aperture 14 mill.

Venezuela: vicinity of Guacharo cave, near the town of Caripe, prov. Cumana (Jonas); *Caracas* (F. Cocking, E. Simon); *Curiana*, on the leaves of palms (Dyson); *La Guayra* (Swift).

Bulimus trigonostomus Jonas, Zeitschr. f. Malak., 1844, p. 36; Mollusk. Beiträge, p. 28, pl. 10, f. 14.—Pfr., Monogr., ii, p. 94.—*Otostomus trigonostomus* Martens, Binnenmoll. Venezuelas, p. 181, in part; Schako, Ibid., p. 181, pl. 2, f. 18 (jaw and dentition).

Bulimus curianianus Rve., Conch. Icon., pl. 58, f. 390 (Jan., 1849).—Pfr., Monogr., iii, p. 374.—*Drymæus curianianus* Jouss., Mém. Soc. Zool. France, ii, p. 242, 1889.

Bulimus knorri Pfr., in Philippi, Abbild. u. Beschreib., ii, p. 115, pl. 4, f. 3 (1846); Monogr., ii, p. 95; iii, 374; iv, 444; vi, 79.—Reeve, Conch. Icon., pl. 42, f. 270.—Schaufuss, Nachrbl. D. M. Ges., 1881, p. 178.—*Bulimulus knorri* W. G. Binney, Proc. Acad. N. S. Phila., 1874, p. 53, and, as *Drymæus*, Ann. N. Y. Acad. Sci., iii, p. 120 (jaw and teeth).—*Drymæus knorri* Jousseaume, Mém. Soc. Zool. France, ii, 242, 1889.—*Bulimulus knorri* Strebel & Pfeffer, Beitr. Mex. Land-und Süssw.-conch., p. 95, pl. 15, f. 7a-d, 8, f. 9a-d.

The base is more compressed and angular than in *D. correctus*, and the aperture generally shorter in proportion to the length of the shell. The original *trigonostomus* had three girdles of square brown spots above and two bands below, like specimens before me from Caracas, where that pattern occurs with the others mentioned in the description above. Reeve's *curianianus* (pl. 39, f. 41, 42, 43) is a somewhat better developed form with wider lip.

There can be no doubt that Pfeiffer's *B. knorri* as originally defined and figured in Philippi's *Abbildungen* is identical with

trigonostomus. His figures represent the streaked form (pl. 39, fig. 34) and the spotted typical pattern of *trigonostomus*.

Var. *correctus* (Pfeiffer). Pl. 39, figs. 31, 32, 33, 35 to 40.

Shell very *openly rimate-umbilicate*, oblong, somewhat fusiform, moderately solid; varying from white or flesh-colored to elaborately banded, streaked or maculated, generally with the lip bright yellow within, often with scattered translucent gray dots. Smooth, shining, showing under the lens slight growth-wrinkles and fine incised spiral striæ, often effaced in places. Spire straightly or convexly conic, apex blue-black or pale, 1½ earlier whorls sculptured in the typical manner. Whorls 6½ to 7½, slightly convex, the last ascending in front, somewhat compressed beneath.

Aperture usually exceeding half the total alt., oblique or subvertical, usually with vivid bands within; *peristome very broadly expanded* throughout; white, yellow or orange; columellar margin obliquely sloping, straightened, usually impressed at its root; columella with a convex fold far above, sometimes obsolete.

Alt. 36–37, diam. 17½–18; alt. of aperture 19 mill.

Alt. 39, diam. 18; alt. of aperture 23 mill.

Alt. 30, diam. 16 mill.

Alt. 36½, diam. 15 mill.

Venezuela: Puerto Cabello (Swift and others); *La Guayra* (Swift); *San Esteban* (Simon).

Bulimus correctus PFR., Zeitschr. f. Malak., 1852, p. 93; Conchyl. Cab., p. 148, pl. 39, f. 3, 4; Monogr., iii, p. 330.—*Otostomus trigonostomus* (in part) MARTENS, Binnenmoll. Venez., p. 181, pl. 1, f. 9–13.

Considered by von Martens a synonym of *trigonostomus*, from which it differs in being more inflated, less compressed basally, and with larger aperture. The coloring varies within wide limits, most of the principal patterns being represented on plate 39. The main color-varieties are as follows:

Figs. 31, 32. Spire long, straightly conic; apex purple-black or red. About five purple-brown spiral bands, and some oblique streaks (typical *correctus*).

Fig. 39. Form similar, but spiral bands wanting or few and faint, longitudinal streaks conspicuous.

Fig. 37. Form similar. Uniform fleshy-brown, pale yellow or white; with or without a blackish submarginal stripe within the lip.

Fig. 35. Spire shorter, convex-conic, aperture large. Whitish or pale flesh tinted, with five (4 to 6) continuous narrow bands, spreading as they reach the lip expansion, bands 2, 3 and 4, 5 more or less approximate or confluent (var. *sexfasciatus* Schauf.; includes var. *quadrifasciatus, tricolor* and *quinquefasciatus* Schauf.).

Fig. 40. Similar, but three bands above broken into square brown spots (var. *guttulatus* Schaufuss).

Figs. 33, 36, 38. Similar in form, but uniform white or fleshy brown, the lip white, orange, or orange with a dark submarginal stripe (var. *percomis* Schauf., fig. 36, and var. *modesta* Schauf., without the dark stripe within).

The names given by Dr. Schaufuss to part of the color-varieties are quoted above; but he has surcharged part of the patterns and omitted to name some others.

D. AURIS (Pfeiffer). *Unfigured.*

Shell deeply compressed-umbilicate, ovate-turrited, rather solid, smooth, white, sparcely marked with waved chestnut streaks; spire turrited, rather acute; whorls 6, convex, the last nearly as long as the spire, rounded, ascending in front. Aperture subvertical, reversed ear-shaped, bordered with violet within; columella deeply and strongly transversely folded, violaceous; peristome broadly expanded, the margins approaching, joined by a callus; columellar margin sinuously elevated. Alt. 39, diam. 14½ mill.; aperture with peristome 20 mill. long, 13 wide in the middle. (*Pfr.*).

Venezuela (Cuming coll.).

Bulimus auris PFR., P. Z. S., 1865, p. 831; Monogr., vi, p. 36.

Group of D. chanchamayensis.

D. CHANCHAMAYENSIS (Hidalgo). Pl. 40, figs. 6, 7.

Shell closely related to *B. canaliculatus* Pfr., but larger, solid, tawny-gray with two somewhat interrupted blackish bands; the upper one spreading above in large spots, the other one a little below the periphery. Columella straighter; peristome broadly expanded throughout. Alt. 43, diam. 23 mill. (*Pfr.*).

Chanchamayo, Peru (Thamm, Isern); *Tarma, Peru* (Jelski).

Bulimus canaliculatus β PFR., Monogr. Helic., vi, p. 78; Novit. Conch., iii, p. 348, t. 82, f. 6, 7.—*Bulimus chanchamayensis* HIDALGO in Journ. Conch., xviii, 1870, p. 49.—PFR., Monogr., viii, p. 111.—*Bulimulus canaliculatus* MARTENS in Malak. Bl., xiv, 1867,

p. 142.—*Bulimus* (*Goniostoma*) *chanchamayensis* Hidalgo, LUBOMIRSKI, P. Z. S., 1879, p. 723.

Hidalgo is doubtless right in separating this form from *D. canaliculatus* Pfr.

D. FABREFACTUS (Reeve). Pl. 40, fig. 5.

Shell umbilicate, obliquely fusiform, solid, striatulate, malleated; tawny-white, painted with flexuous reddish streaks. Spire long conic, acute; whorls 7, rather flat, the last a little shorter than the spire, the base narrowly compressed around the umbilicus; columella very concave. Aperture nearly vertical, subrhombic, somewhat channelled at base; peristome somewhat thickened, the margins joined by a flesh-colored callus, right margin lightly arcuate, narrowly expanded, columellar margin dilated, spreading. Alt. 38, diam. 14 mill.; apert. 18 mill. long. (*Pfr.*).

Province of Merida, U. S. of Colombia (Linden); *Santa Fé de Bogota* (Pfr.).

Bulimus fabrefactus RVE., Conch. Icon., pl. 49, f. 319 (November, 1848).—PFR., Monogr., iii, p. 373; iv, p. 443; vi, p. 78.

"Of the same peculiarly angled structure at the base as the *B. canaliculatus*, from which it is amply distinguished by its more elongated form, solid growth and different style of coloring."

D. PLICATOLIRATUS (da Costa). Pl. 50, fig. 83.

Shell ovate-fusiform, the base compressed, carinated, umbilicate. Whorls 7, convex, with compressed sutures, longitudinally rudely white-plicate or lirate; tawny, encircled by two narrow white zones, the apex black. Columella reflexed. Aperture oblong-oval, broadly channelled below, purple-brown and two-zoned inside; outer lip white, somewhat expanded and reflexed. Alt. 37, diam. 15·5; aperture with peristome 17 mill. long, 11 wide (*Da Costa*).

Bogotá, Colombia.

Bulimulus (*Drymæus*) *plicatoliratus* DA COSTA, Proc. Malac. Soc. Lond., iii, p. 80, pl. 6, f. 1 (July, 1898).

D. PULCHERRIMUS (H. Adams). Pl. 34, fig. 9.

Shell subperforate, fusiform, rather thin, obsoletely irregularly striate, smooth; whitish, ornamented with white-dotted blackish-chestnut streaks, which are sinuate above and broken into two series of spots below. Spire turrited. Whorls moderately convex, the

last compressed and strongly, obtusely keeled at base. Columella arcuate. Aperture slightly oblique, rhombic-oval; peristome rose-colored, the ends joined by a thin callus, right margin expanded, columellar margin reflexed, adnate above. Alt. about 45, diam. 17 mill. (*H. Ad.*).

Eastern Peru (Bartlett).

Otostomus pulcherrimus H. Ad., P. Z. S., 1866, p. 442, pl. 38, f. 3. —*Bulimus pulcherrimus* Pfr., Monogr., viii, p. 110.

"One example only of this beautiful species has been obtained, and of that, unfortunately, the upper whorls are deficient."

D. CHIMBORASENSIS (Reeve). Pl. 40, fig. 1.

Shell fusiform, somewhat attenuated at the base, scarcely umbilicated; whorls 6 in number, convex, longitudinally very closely elevately striated. Columella depressly reflected; lip slightly expanded, not reflected. Rose-brown, banded with white, lip and columella deep purple-rose (*Rve*).

Chimborazo (Dennison coll.).

Bulimus chimborasensis Rve., Conch. Icon., pl. 44, f. 275 (October, 1848).

Compare *D. decoratus* Lea, from which this differs in the more slender form and the color-pattern.

D. DECORATUS (Lea). Pl. 40, figs. 2, 3.

Shell oblong-turrited, with a very narrow umbilical chink; solid, with *three broad ochraceous bands on a white ground* on the last whorl, the upper two continuing upward upon the penultimate and part of the next earlier whorl, the *ground-color gradually changing above to deep pink*, which is uniform upon the earlier 3½ whorls. Somewhat shining, with coarse, low, irregular wrinkles of growth, and no other sculpture. Whorls 5¼, very convex, the last distinctly *tapering and compressed toward the base.*

Aperture fusiform-oval, showing *three broad, bright pink bands inside;* passing below into *a short, effuse basal channel or "spout;"* peristome slightly expanded, the outer lip white-edged outside and within, columellar lip narrowly reflexed, adnate above a narrow umbilical chink, passing in a gradual curve into the moderately strong, long pink parietal callus. Columella deeply concave above, projecting in an angle basally. Alt. 29, diam. 14; alt. of aperture 15, greatest width (including peristome) 10 mill.

Near Carthagena, U. S. of Colombia (J. H. Gibbon, M. D., type locality); *environs of Quito, Ecuador* (Paz).

Bulimus decoratus LEA, Trans. Amer. Philos. Soc., vi, 1836, p. 86, pl. 23, f. 108 (June, 1838); Obs. Genus Unio, ii, p. 86, pl. 23, f. 108. —HIDALGO, Journ. de Conchyl., 1870, p. 50.—PFR., Monogr., ii, p. 182; iii, p. 375; iv, p. 444; vi, p. 80; viii, p. 113. Not *Helix decorata* Fér., Prodr. no. 327, nor *Bulimus decoratus* Gray, Ann. of Philos. (n. s.), ix, p. 413 (1825), and of some subsequent authors, a form of *Helicostyla* (Manual, viii, p. 11).—*Drymœus decoratus* COUSIN, Bull. Soc. Zool. de France, xii, 1887, p. 214.—*Goniostomus decoratus* MILLER, Mal. Blatt., 1878, xxv, p. 192.

Lea's form differs from that described by Reeve as *B. chimborasensis*, in being decidedly broader, with a different band-pattern. The specific identity of the two forms remains an open question.

Figures and description are from one of the two types, U. S. National Museum, No. 105,154. The locality given by Paz probably pertains to *D. chimborasensis*.

Var. *goniobasis* Pilsbry, n. v. Pl. 40, fig. 4.

Larger, with more elongate spire of 6½ very convex whorls; three-banded on a pure white ground, the upper band very narrow, all of a deep chestnut-brown color; the upper two bands ascending the spire, earliest two whorls white. Aperture white with three dark bands inside, terminations of the bands and the parietal wall very faintly rose-tinted. Alt. 34·7, diam. 15·3; alt. of aperture 15·7, greatest width 11 mill.

Near Santa Ana, U. S. of Colombia (Bland).

Group of D. nystianus.

D. NYSTIANUS (Pfeiffer). Pl. 46, figs. 63, 64, 65.

Shell rimate or nearly imperforate, ovate-pointed, thin. Creamy or yellowish-white, with irregular longitudinal streaks of brown or blackish-brown, fainter near the suture, and frequently several rather wide, light brownish spiral zones interrupted by light streaks. Surface shining, with irregular wrinkles of growth and some appearance of fine malleation. Spire conic, variable in length; apex slightly obtuse, the nepionic 1¾ whorls with very minute but typical *Drymœus* sculpture. Whorls nearly 6, but slightly convex, the sutures superficial, irregularly crenulated; last whorl large, oval, rather ventricose, *more or less distinctly angulated at base*, the angle bounding a flattened umbilical tract. Aperture oval, slightly oblique, white or streaked inside, *angular at the base;* outer lip thin,

sharp, not expanded, regularly arcuate; columella weakly folded, the edge reflexed and appressed.

Alt. 29½, diam. 15½; alt. of aperture, 17 mill.

Alt. 31½, diam. 15½; alt. of aperture, 15 mill.

Ecuador: Pomasqui Valley (Bourcier); *Quito* (Martinez and others); *Machache* (Paz); *Tumbacenti* (Boetzkes); *Tumbaco, Chillogallo* (Cousin).

Bulimus nystianus PFR., P. Z. S., 1852, p. 154; Conchylien Cabinet, p. 99, pl. 32, f. 15, 16; Monogr. iii, p. 374; iv, 444; vi, 80; viii, 112.—HIDALGO, Journ. de Conchyl., 1870, p. 50; Mol. Viaje al Pacifico, p. 78.—*Goniostomus nystianus* MILLER, Mal. Bl., xxv, 1878, p. 192.—*Thaumastus* (?) *nystianus* COUSIN, Bull. Soc. Zool. France, 1887, p. 220.

The wide range of color variation is alluded to below. In the prominence of the basal angle there is great mutation, it being quite strong in some, nearly obsolete in other specimens.

Hidalgo mentions these color-forms: (1) shell unicolored, pale citron, the columella roseate; (2) with distant, distinct streaks, the basal angle whitish, and (3) with transverse bands of the same color as, and crossing, the streaks, the basal angle white.

Cousin writes that all around Quito, at about 2,840 meters alt., it is of large size; at Tumbaco, at 2,390 meters, intermediate, and at Chillogallo, 2,893 meters above sea level, a small variety; at all of these localities the variety *lutea* occurs. "*Th. nystianus* varies according to locality, in size and coloration. All the intermediate colors between yellow and greenish-black occur" (*Cousin*).

"Var. *nigricans*. I collected along the railroad between Pomasqui and Chilguiltina, canton of Quito, several individuals of this species, all of great size and a greenish-black color" (*Cousin*).

D. CANALICULATUS (Pfeiffer). Pl. 40, fig. 8.

Shell umbilicated, obliquely fusiform, wrinkle-striate, shining; whitish, marbled with flesh-color and reddish. Spire turrited-conic, acute. Whorls 7, slightly convex, the last a trifle longer than the spire, *strongly pinched into a keel at base*. Columella arcuate, prolonged forward. Aperture oval, channelled at base; peristome simple, thin, the right margin a trifle expanded, columellar margin dilated, reflexed. Alt. 37, diam. 14; aperture 19 mill long (*Pfr.*).

Bolivia.

Bulimus canaliculatus PFR., P. Z. S., 1845, p. 68; Monogr., ii, p. 93.—REEVE, Conch. Icon., pl. 41, f. 256.—*Otostomus canaliculatus* Pfr., H. ADAMS, P. Z. S., 1866, p. 442 (from eastern Peru, Bartlett coll.).

Cousin considers this closely allied to *D. nystianus*, perhaps an extreme variety of that species.

D. AMBUSTUS (Reeve). Pl. 46, figs. 66, 67.

Shell nearly imperforate, ovate, thin; white, more or less yellow beneath, often rose-tinted on the spire, marked with *irregularly spaced narrow chestnut and yellow streaks*, fainter toward the suture above, and often partially interrupted by a subperipheral light line. Surface shining, smooth, with faint, irregular growth striation. Spire short-conic, apex with very fine but typical *Drymæus* sculpture. Whorls 5½, rather convex, separated by superficial sutures; last whorl convex, somewhat tapering below.

Aperture ovate, white or streaked within, oblique; peristome thin, sharp, unexpanded; columella with a spiral fold above (very strong in immature shells), the edge reflexed and closely appressed.

Alt. 26, diam. 13½; alt. of aperture 13½ mill.

Ecuador: between Jacunga [*Tacunga*] *and Ambato* [*Ambuta*] (Bourcier); *La Mocha* (Paz); *Alchipichi* (Martinez); *Tumbaco* (Boetzkes, Cousin); *Cotocollas, Guapulo* (Cousin).

Bulimus ambustus REEVE, Conch. Icon., pl. 74, f. 535 (August, 1849).—PFR., Conchyl. Cab., p. 106, pl. 33, f. 22, 23; Monogr., iii, p. 409; viii, p. 145.—HIDALGO, Journ. de Conchyl., 1870, p. 57; Viaje al Pacifico, p. 106.—*Thaumastus ambustus* MILLER, Malak. Bl., xxv, 1878, p. 193.—COUSIN, Bull. Soc. Zool. France, 1887, xii, p. 221.

Allied to *D. nystianus*, but the base is not in the least angular, the surface is smoother and the color-pattern different. The series before me supports Cousin's opinion that *B. chamæleon* Pfr. is merely a variety of *ambustus*.

Var. *chamæleon* (Pfeiffer). Pl. 46, figs. 68, 69.

Form similar to *D. ambustus*, but often more slender, the lateral outlines of the spire more convex. Yellowish-white with broad, longitudinal stripes of purple-brown or dark chestnut, occasionally not extending to the columella, leaving a small light basal area.

Alt. 26, diam. 12–13; alt. of aperture 12 mill.

Ecuador: *Quito* (Bourcier); *La Mocha* (Paz); *Cumbaya, Baeza and Nanegal* (Martinez).

Bulimus loxensis var., PFR., Monogr., iii, p. 422; Conchylien Cab., pl. 33, f. 17, 18.—*Bulimus chamæleon* PFR., P. Z. S., 1855, p. 116; Monogr., iv, p. 483.—HIDALGO, Journ. de Conchyl., 1870, p. 57; Viaje al Pacifico, p. 107.—*Thaumastus chamæleon* MILLER, Malak. Bl., xxv, p. 193.—COUSIN, Bull. Soc. Zool. France, xii, 1887, p. 224.

Some individuals, writes Hidalgo, are nearly blackish on the last whorl by the coalescence of the longitudinal stripes.

D. LOXENSIS (Pfeiffer). Pl. 51, fig. 20.

Shell umbilicate, ovate-oblong, striatulate; white, irregularly flamed with interrupted reddish streaks. Spire pyramidal, acute; whorls 7½, rather flattened, the last about three-sevenths the total length. Columella somewhat twisted, entering. Aperture oblong-oval, colored within like the exterior; peristome simple, acute; columellar margin broadly reflexed, spread. Alt. 35, diam. 14 mill.; aperture 16 mill. long, inside 7 wide (*Pfr.*).

El Catamaya, near Loxa, Ecuador (Hartwig).

Bulimus loxensis PFR., Symbolæ ad Histor. Helic., iii, p. 85 (1846); Monogr., ii, p. 203; iii, p. 442 (exclusive of variety); vi, p. 129.—REEVE, Conch. Icon., pl. 40, f. 251.—*Thaumastus loxensis* MILLER, Malak. Bl., 1878, xxv, p. 193.—COUSIN, Bull. Soc. Zool. Fr., xii, 1887, p. 228.

Differs from *D. ambustus* in being umbilicated, with longer spire, and over seven, instead of less than six, whorls.

D. CACTIVORUS (Broderip). Pl. 48, figs. 31, 32; pl. 50, figs. 81, 82.

Shell ovate-pyramidal, *almost imperforate*, thin; white, somewhat cream-tinted below, *the apex blue-black*, with (form *nitidus*) or without (typical *cactivorus*) numerous obliquely longitudinal black-brown or reddish-brown streaks, *which are lineolate with white.* Surface glossy, frequently showing iridescent patches under a lens, *coarsely and rather irregularly costulate-striate.* Spire straightly conic, apex obtuse, the nepionic 1⅔ whorls with typical *Drymæus* sculpture. Whorls 6, slightly convex, the last frequently somewhat angular at the periphery.

Aperture oblique, ovate, less than half the length of the shell, colored within like the exterior; outer lip sharp, thin and unex-

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panded, columella concave, with the margin reflexed and adnate above.

Alt. 23, diam. 11, alt. of aperture 10 mill.; sometimes larger, alt. 28 mill.

Monte Christi, Colombia (Cuming, for typical *cactivorus*); *Guayaquil and prov. Loja* [Loxa], *Ecuador* (Wolf); *Tumbez, Peru* (Cuming).

Bulinus cactivorus Brod., P. Z. S., 1832, p. 31.—Sowb., Conch. Illustr., f. 2*.—*Bulimus cactivorus* Desh. in Lam., An. s. Vert., viii, p. 270.—Pfr., Monogr., ii, p. 175.—Mousson, Malak., Bl., xvi, p. 176.—*B. nitidus* Reeve, f. 103a.—*Mormus cactivorus* Cousin, Bull. Soc. Zool. Fr., xii, p. 229.

Bulinus nitidus Brod., P. Z. S., 1832, p. 31.—Sowb., Conch. Illustr., f. 2.—*Bulimus nitidus* Pfr., Monogr., ii, p. 176; viii, p. 153.—Reeve, Conch. Icon., pl. 18, f. 103b.—Dohrn, Jahrb., vii, p. 89.—*Bulimulus nitidulus* Beck, Index Moll., p. 67.—*Mormus occidentalis* Miller, Malak. Bl. (n. F.), i, p. 121, pl. 13, f. 2.—Cousin, Bull. Soc. Zool. France, xii, 1887, p. 230.

Common along the coast from Tumbez, Peru, to Monte Christi, Colombia. The passage from the whitish to the streaked forms seems to be a gradual one, but it is to the latter that the names *nitidus, nitidulus* and *occidentalis* have been applied. The irregular striation, very coarse for so thin a shell, almost wholly closed umbilical chink and dark apex are moderately constant characters throughout the species. Pl. 50, figs. 81, 82, are *occidentalis* of Miller.

D. decoloratus (Sowerby). Pl. 45, fig. 30.

Shell oblong, subacuminate, whitish, very thin; whorls 5 or 6, longitudinally striated, a little inflated, with some interrupted brownish girdles; aperture oval, the margin acute, umbilicus small. Length 0·5, diam. 0·25 inch (*Sowb.*).

Shell openly perforate, ovate-acute, striatulate, whitish, streaked with corneous and bifasciate at base; whorls 6, a little convex, the last a little shorter than the spire; columella subvertical. Aperture oval; peristome simple, acute, the columellar margin dilated, overhanging, reflexed at the perforation. Alt. 13, diam. 6; alt. of aperture 6 mill. (*Pfr.*).

Hills around Lima, Peru, buried in the earth under bushes (Cuming).

Bulinus decoloratus Sowb., P. Z. S., 1833, p. 73.—*Bulimus decoloratus* Pfr., Monogr., ii, p. 211; iii, p. 424; vi, p. 132.—Reeve, Conch. Icon., pl. 21, f. 128.

"The first two whorls of this shell are characterized by a very minute shagreen appearance, discernable only with the lens" (*Rve.*).

Reeve's figure does not agree with Sowerby's description in color-pattern. I have not seen the species.

D. visendus (Hidalgo). Pl. 51, figs. 9, 10.

Shell nearly covered perforate, ovate-acuminate, hyaline, thin, very glossy, striatulate; green, encircled by many darker transverse lines. Spire rather elongate-conic, the apex obtuse, rather pale. Whorls 6½ to 7, a little convex, the last one convex, a little descending in front, about three-sevenths the length of the shell, rotund at base. Aperture oval, colored like the outside; peristome simple, unexpanded, the margins joined by a very thin callus; right margin subarcuate, subacute; columellar margin narrowly reflexed, covering the perforation. Alt. 30, diam. 14; alt. of aperture inside 15, width 8 mill. (*Hidalgo*).

Baeza (Martinez) *and San José* (Espada), *Ecuador.*

Bulimus visendus Hid., Journ. de Conchyl., xvii, 1869, p. 50, pl. 5, f. 8; Journ. de Conchyl., 1870, p. 58; Catal. Coq. Terr., p. 33; Mol. Viaje al Pacifico, p. 100, pl. 8, f. 1, 2.—Pfr., Monogr., viii, p. 150.—*Mesembrinus visendus* Miller, Mal. Bl., xxv, 1878, p. 191.

The spiral lines are generally very fine, but sometimes some of them are wider than others, particularly one about in the middle of the last whorl. The suture is quite deep. It is distinguished from other Ecuadorian forms by the thinness and shining appearance, and especially by the quite deep green color of the shell. At San José, M. Espada collected a very pretty variety, which is small and ornamented with a white band around the base of the last whorl. (*Hidalgo*).

Group of D. farrisi.

A group of Peru and Ecuador, comprising elongated, usually much variegated shells with the lip simple and unexpanded.

Probably some of the species included in the *D. poecilus* group, such as *canarius* Ph., belong nearer these forms.

D. chrysomelas (Martens). Pl. 47, figs. 1, 2, 3, 4.

Shell fusiform-elongate, perforate, rather coarsely striated, shining; brown-black, with yellow streaks. Whorls 7, rather flat, the

earlier three unicolored red brown, suture very delicately crenulated, narrowly white. Aperture subvertical, two-fifths the total length of the shell, ovate-elliptical, rounded at base; peristome roseate, the outer margin unexpanded, basal slightly expanded, columellar margin dilated, reflexed; columella twisted.

Var. *raristriga*, generally a little more obese; length 43, greater diam. 18, lesser 13½; aperture 19 mill. long, 9 wide inside.

Var. *crebristriga* painted with very close, very fine streaks and three subarticulated bands. Alt. 47½, greater diam. 15, lesser 13; aperture 19 mill. long, 8 wide inside. (*Martens*).

On the Chanchamayo, an affluent of the Ucayali R., one of the headwaters of the Amazon (Thamm); *Tunin, Peru* (Jelski); *Napo, Ecuador* (Martinez).

Bulimulus (*Thaumastus*) *chrysomelas* MARTENS, Malak. Bl., xiv, 1867, p. 145.—*Bulimus chrysomelas* PFR., Monogr., vi, p. 133; Novit. Conch., p. 348, pl. 82, f. 1–5.—HIDALGO, Journ. de Conch., 1870, p. 48.—LUBOMIRSKI, P. Z. S., 1879, p. 724.

Von Martens compares this with *B. farrisi* Pfr., but that is more acute, with the last whorl larger proportionally, and it generally has spiral striæ.

D. FARRISI (Pfeiffer). Pl. 47, figs. 5, 6, 7.

Shell openly rimate, fusiform-turrited, rather solid. Varying from uniform *opaque, rose-white,* to densely speckled and streaked with livid pink. Surface glossy, having rather coarse wrinkles along the growth lines, and in some specimens spaced spiral striæ, visible under the lens. Spire drawn out, attenuated, frequently becoming ruddy or blackish near the apex, which when not lost (self amputated?) is rather obtuse, the nepionic shell with 1¾ whorls with typical *Drymæus* sculpture. Whorls 6½–7½, nearly flat, the sutures very oblique; last whorl usually somewhat obliquely produced, but slightly convex above, tapering below.

Aperture decidedly oblique, varying from *bright orange* or reddish inside to yellow or purplish-brown, long-ovate, half the length of shell or less; peristome with a narrow white edge, not expanded; columella straight or with a slight fold above, concave below, white, the margin broadly dilated above.

Alt. 52, diam. 20½; alt of aperture 23 mill.

Alt. 42, diam. 15; alt. of aperture 19 mill.

Andes of Peru, province of Patas.

Bulimus farrisi Pfr., P. Z. S., 1858, p. 258, pl. 42, f. 8; Malak. Bl., 1859, p. 46; Monogr., vi, p. 126.

The figured type of *D. farrisi* is a much variegated shell (pl. 47, fig. 6) with moderate umbilical crevice and "*fusco-crocea*" aperture. Shells of this kind generally show minute incised spirals, rather separated, the intervals densely crenulated by vertical striæ. From this mean there are variations (1) toward uniform pink-white shells with bright reddish-orange interior, rather wider umbilical crevice, obsolete or subobsolete spiral striation, and generally mutilated apex (fig. 7), and (2) toward an even more speckled coloration, ruddy apical whorls, brownish interior, almost appressed columellar lip nearly closing the umbilical chink (fig. 5). These examples form a passage to

D. vespertinus (Pfeiffer). Pl. 47, figs. 8, 9, 10, 11.

Shorter than *farrisi*, with decidedly shorter spire, more oval body whorl, which tapers more below, almost imperforate umbilical crevice the columella plicate above with reflexed, appressed outer edge. Surface smoothish, hardly wrinkled, with subobsolete spiral striation; coloring of red or dark reddish-brown streaks profusely dotted with white, alternating with irregular white or pink streaks, the earlier whorls reddish or blackish. Aperture half the alt. or somewhat more, dark purplish-brown or reddish within, showing the external pattern, decidedly narrower below than in *D. farrisi;* lip simple, thin; basal lip decidedly receding; whorls 6½–7½. Alt. 35, diam. 15; alt. of aperture 18–19 mill.

Province of Patas, Peru (Farris); *Pataz* (Paz.).

Bulimus vespertinus Pfr., P. Z. S., 1858, pl. 257, pl. 42, f. 3; Malak. Bl., 1859, p. 44; Monogr., vi, p. 109; Novit. Conch., iii, p. 465, pl. 101, f. 16–19.—Hidalgo, Journ. de Conchyl., 1870, p. 63.

There is a good deal of variation in size, more in coloring. In some specimens a wide ill-defined pink zone revolves below the suture and another around the columella, replacing the dark reddish-brown streaks of the median part of the whorl. This form resembles *D. rubrovariegatus.* It is very likely that more complete series will show *D. farrisi* and *D. rubrovariegatus* to be merely varieties of *D. vespertinus.* That they are all variable forms is demonstrated by the series before me, in which the extreme forms are nearly connected by intermediate examples.

D. RUBROVARIEGATUS (Higgins). Pl. 47, figs. 12, 13, 14, 15.

Shell rimate, oblong, fusiform, rather thin, but moderately solid, lightly striate, smooth; white, variegated with blackish stripes which are more or less interrupted and white-dotted, and often edged on one side with red; a subsutural band reddish or white, and with a red area around the columella. Whorls 7 to 8, somewhat convex, the last tapering below. Aperture narrow and long, variegated inside, the outer lip sharp and simple, regularly arcuate, parietal margin and columella forming an unusually straight inner lip, slightly concave in the middle; basal lip abruptly receding. Columella reflexed and appressed, truncate at base.

Alt. 37, diam. 13; length of aperture 17, breadth 6½ mill.

Alt. 30, diam. 11⅓; length of aperture 14, breadth 5½ mill.

Huamachuco, Peru.

Bulimus rubrovariegatus HIGGINS, P. Z. S., 1868, p. 178, pl. 14, f. 2, 2a.—PFR., Monogr., viii, p. 149.

More slender than *D. vespertinus*, with the aperture proportionately smaller. In *D. scitulus* the red variegation is absent, the aperture still shorter, and the spire more developed.

D. LOXANUS (Higgins). Pl. 48, figs. 39, 40.

Shell subperforate, ovate-fusiform, rather thin, longitudinally plicate-striate, obscurely striolate spirally. Grayish-brown, encircled by chestnut bands and buff lines, and with irregularly scattered buff dots. Spire somewhat convexly conic, with rather acute apex; sutures distinct. Whorls 7, a little convex, the last a little shorter than the spire, tapering and red at base. Aperture a little oblique, acuminate-oval, chestnut-colored inside, with the bands and dots showing through, the margin red; columella rather straight, minutely granulose, red; peristome simple, unexpanded, the basal margin somewhat expanded, columellar margin dilated above, somewhat appressed, vaulted, reflexed. Alt. 29, diam. 11 mill.; aperture 14 mill. long, 6 wide. (*Higgins*).

Loxa, Ecuador (Buckley); *between Popayan and the Hacienda Sotará, Colombia*, at about 2400 meters alt. (Stübel).

Otostomus loxanus HIGGINS, P. Z. S., 1872, p. 685, pl. 56, f. 2, 2a.—MARTENS, Conch. Mittheil., p. 160.—*Bulimus loxanus* PFR., Monogr., viii, p. 150.

D. SCITULUS (Reeve). Pl. 47, figs. 16, 17, 18.

Shell almost imperforate, oblong-turrited, rather solid, though thin. Opaque-white, with numerous longitudinal, arcuate, purple-black stripes not extending above to the suture, which is bordered below by a white band, nor below to the base, there being a yellow basal area; early whorls red. Surface glossy, the growth wrinkles very slight. Spire high, turrited, the sutures impressed; apex with shallow but typical *Drymæus* sculpture. Whorls 7, somewhat convex, the last convex, tapering below.

Aperture small, brown-streaked within, much less than half the alt. of shell; peristome thin, unexpanded; columella vertical or obliquely obsoletely folded, the outer edge reflexed and appressed, leaving but a slight umbilical chink.

Alt. 28, diam. 10½; alt. of aperture 11 mill.

Chachapoyas, Peru (W. Lobb); *between Macanya and the Maranon River* (Raimondi).

Bulimus scitulus REEVE, P. Z. S., 1849, p. 97; Conch. Icon., pl. 97, f. 513.—PFR., Monographia, iii, p. 411; viii, p. 151.

In *D. scitulus* the spire is more turrited and the aperture shorter than in *D. rubrovariegatus*. *D. lamas* and *trujillensis* have the last whorl more elongated, especially as seen in a dorsal view.

The specimens before me, two of which are shown in figs. 17 18, differ from Reeve's figure in having a wide light subsutural band and basal area, as described above. I believe them to be specifically identical however. Pfeiffer's diagnosis of the typical form is as follows: "Subperforate, subfusiform-oblong, rather solid, rather smooth, glossy; dull whitish, ornamented with close narrow streaks of orange and scarlet; spire long-conic, rather acute. Whorls 7, slightly convex, the last three-sevenths of the length, tapering at base. Aperture subvertical, narrow, subrhombic-oblong; peristome simple, unexpanded, the right margin lightly arcuate, columellar margin a little reflexed and vaulted above. Alt. 29, diam. 11; alt. of aperture 13, width 5½ mill."

Reeve remarks "neatly marked with fine waved white lines upon a purple-blue ground, tinged toward the base with a bright rust-red."

Var. *citrinellus* ('Philippi' Pfeiffer). Whorls a little more convex, no scarlet streaks. Collected with the type form by Raimondi.

D. EDMULLERI (Albers). Pl. 47, figs. 22, 23.

Shell narrowly perforate, fusiform-oblong, rather thin, longitudinally striated; buff-white, ornamented with black-brown wavy streaks interrupted in bands. Spire turrited, rather acute. Whorls 6½, rather flat, the last a little shorter than the spire, tapering at base, distinctly striated. Columella receding, slightly folded. Aperture little oblique, oblong; peristome thin, the margins subparallel, right margin a little expanded, somewhat sinuate above; columellar margin buff, dilated and subappressed. Alt. 29½, diam. 10.; alt. of aperture 14½, width 6 mill. (*Pfr.*).

On the Maranon River, Colombia (Warszewicz).

Bulimus edmülleri ALB., Malak. Bl., i, p. 218 (1854).—PFR., Novit. Conch., i, p. 42, pl. 11, f. 3, 4; Monogr., iv, p. 408.

Seems allied to *D. scitulus*, but the streaks are festooned.

D. TRUJILLENSIS (Philippi). Pl. 48, figs. 24, 25.

Shell perforate-umbilicate, oblong-turrited, subfusiform, thin, slightly striate, shining. White, ornamented with close scarlet or reddish streaks. Spire turrited, somewhat obtuse, the apex white; whorls 7, a little convex, the last three-sevenths the total alt. Aperture oblong, colored within like the outside; columella strongly twisted; peristome simple, acute, right margin subsinuate above, columellar margin reflexed, not closing the perforation. Alt. 34, diam. 13; aperture 15 mill. long, 6 wide. (*Phil.*).

Trujillo (Raimondi, Stoltzman), and *Huamachuco* (Paz), *Peru.*

Bulimus trujillensis PH., Malak. Bl., xiv, p. 73 (1867).—PFR., Novit. Conch., p. 333, pl. 80, f. 1, 2; Monogr., vi, p. 129.—HIDALGO, Journ. de Conch., 1870, p. 48.—LUBOMIRSKI, P. Z. S., 1879, p. 724.

Hidalgo remarks that in the fully adult example collected by Paz the shell is more solid and the umbilical perforation less apparent than in the original specimens. Probably the following species is merely a form of *trujillensis.*

D. LAMAS (Higgins). Pl. 48, figs. 26, 27.

Shell subperforate, oblong-turrited, thin, nearly smooth, irregularly lightly striated. Whitish, ornamented with chestnut streaks. Spire lengthened, the apex acute. Whorls 7, rather flat, the last rounded at base; columella rather straightened. Aperture little oblique, oval, chestnut colored inside; peristome simple, unex-

panded, the columellar margin reflexed above, subadnate. Length 33, diam. 10 mill.; aperture 14 mill. long, 5 wide. (*Higgins*).

Jouctabamba, Peru.

Bulimus (*Otostomus*) *lamas* HIGG., P. Z. S., 1868, p. 179, pl. 14, f. 3, 3a.—PFR., Monogr., viii, p. 166.

As Pfeiffer remarks, this species seems from the figures to be very much like *trujillensis*.

D. SACHSEI (Albers). Pl. 47, figs. 19, 20, 21.

Shell perforate, ovate-turrited, rather thin, nearly smooth, (irregularly striolate), shining; *white, ornamented with blackish-chestnut streaks, dotted or guttate with white.* Spire convex-conic, the apex rather obtuse, corneous [or black-tipped]. Whorls 7, a little convex, the last about three-sevenths the total length, tapering and white at base. Aperture slightly oblique, oval-oblong, with a lilac gleam inside [or dull purplish]; peristome unexpanded, acute, rose-colored; the right margin lightly arcuate; columellar margin twisted, abruptly reflexed, dilated above, *with a more or less distinct oblique furrow where it joins the body-whorl.* Alt. 29, diam. 13; alt. of aperture 13, width nearly 7 mill. (*Pfr*). Alt. 27½, diam. 12½, alt. of aperture 12 mill.

Upper course of the Maranon River in Ecuador and Peru, from near Jaen to the mouth of the Napo River. Tambillo (Stoltzmann), *neighborhood of Moyobamba, at about* 870 meters alt. (Stübel), *Peru; Catamayo, prov. Loja,* (*Loxa*), *Ecuador* (Wolf.).

Bulimus sachsei ALBERS, Malak. Bl. 1854, p. 30.—PFR., l. c., 1855, p. 159 (*Mesembrinus*); Monogr., iv, p. 484.—LUBOMIRSKI, P. Z. S., 1879, p. 725.—*Otostomus* (*Drymœus*) *sachsei* MARTENS, Conchol. Mittheil., pp. 161, 175, pl. 35, fig. 11, 12.—SCHAKO, t. c., p. 209 (jaw and dentition).—*Mormus catamayensis* MILLER, Malak. Bl. (n. F.), i, p. 120, pl. 12, f. 4. *Conf.* DOHRN, Jahrb. D. M. Ges., vii, p. 88.—*Thaumastus sachsei* MILLER, Malak. Bl., XXV, p. 193.—COUSIN, Bull. Soc. Zool. France, xii, 1887, p. 227. Conf. DOHRN, Jahrb. D. M. Ges., vi, 1879, p. 189.—? *Bulimus sporadicus* REEVE, Conch. Icon., pl. 49, f. 325 (not of Orbigny).

Besides the ordinary form with black streaks profusely speckled with white, there are paler, brown streaked specimens, and partial albinos (fig. 19) in which the original pattern is scarcely recognizable. The slight groove at the root of the columella is characteristic.

Dohrn and von Martens have fully discussed the geographic range and synonymy of this species; but the latter author erroneously includes *Bulimus culmineus* Reeve (not Orb.).

D. LEUCOMELAS (Albers).

Shell compressed-umbilicate, oblong-turrited, rather thin, striated, white, or rarely pale buff, ornamented with blackish streaks, here and there spotted with white. Spire lengthened-conic, rather acute. Whorls 8, a little convex, the last forming nearly two-fifths of the total length, somewhat compressed basally. Aperture slightly oblique, narrow, acuminate-oval; peristome simple, unexpanded; the columellar margin receding, dilated above, overhanging, conspicuous. Alt. 29, diam. scarcely 10 mill.; aperture 12½ mill. long, 5½ wide. (*Pfr.*).

On the Maranon River (Warscewicz).

Bulimus leucomelas ALBERS, Malak. Bl., i, p. 219 (1854).—PFR., Monogr., iv, p. 488.

D. VEXILLUM (Wood). Pl. 48, fig. 33.

Shell openly perforate, oblong-acuminate, thin, striate, shining; whitish, with three equal blackish-brown encircling bands and a fourth one around the perforation. Spire turrited, rather acute. Whorls 8, slightly convex, the last two-fifths to three-sevenths the total length. Aperture oblong-oval; peristome thin, unexpanded, acute; columellar margin subvertical, dilated. Alt. 32, diam. 12; length of aperture 14 mill. (*Pfr.*).

Truxillo, Peru (Cuming).

Helix vexillum WOOD, Index Testac., Suppl., pl. 8, f. 78*a* (1828). —*Bulimulus vexillum* BECK, Index Moll., p. 67.—*Bulimus vexillum* PFR., Monogr., ii, p. 205; iii, p. 427; iv, p. 490; vi, p. 136; viii, p. 171 (including *pulchellus*, *varians* and *rubellus*).—*Bulinus pulchellus* BROD., P. Z. S., 1832, p. 106.—SOWB., Conchol. Illustr., f. 17.—*Bulimus varians* REEVE, C. Icon., pl. 18, f. 104 c.

Var. VARIANS (Broderip). Pl. 48, fig. 34.

Shell openly perforate, oblong-acuminate; cream-white, closely marked with ragged, irregular longitudinal streaks of blackish-chestnut, the base with a light spiral band surrounding the columella. Surface rather coarsely but sparsely and irregularly stri-

ate, showing traces of minute spiral impressed striæ in places. Alt. 30½, diam. 12½; alt. of aperture 14 mill.

Peru: Truxillo, with *B. pulchellus* (Cuming): *Chocquequirao* (Angrand).

Bulinus varians Brod., P. Z. S., 1832, p. 107.—Sowb., Conch. Illustr., f. 20, 20.*—*Bulimus varians* Orb., Voy. Amér. Mérid., p. 284.—Desh. in Lam., An. s. Vert., viii, p. 266.—Reeve, Conch. Icon., pl. 18, f. 104*b*.—Morel., Sér. Conch., iii, p. 208.

Differs strikingly from *D. vexillum* in coloration, but is considered by Pfeiffer to be a variety of that species.

Var. rubellus (Broderip). Pl. 48, fig. 35.

Shell thin, diaphanous, somewhat pyramidal, pale red, obscurely maculose with whitish; whorls 7, longitudinally striated; umbilicus moderate. Alt. 1⅛, diam. 1 5/12 inch. (*Brod.*).

Truxillo, Peru (Cuming).

Bulinus rubellus Brod., P. Z. S., 1832, p. 124.—Sowb., Conch. Illustr., f. 32.—*Bulimus rubellus* Dh. in Lam., viii, p. 268.—*Bulimus varians* Reeve, C. Icon., pl. 18, f. 104*a*.

There is often a chestnut band around the perforation, as in the other forms of the species. A specimen before me is longitudinally streaked with faint scarlet and white, and measures, alt. 29, diam. 11, alt. of aperture 13 mill., being more slender than the types.

D. tigris (Broderip). Pl. 48, fig. 30.

Shell subperforate, ovate-fusiform, thin, shining, longitudinally plicatulate; tawny-white, narrowly and closely streaked with chestnut. Spire turrited, the apex acute, pale; whorls 7, flattened, the last about three-sevenths the length, tapering at base; columella nearly straight. Aperture oval-oblong; peristome acute, the right margin unexpanded, columellar margin dilated above, triangular, subappressed. Alt. 37, diam. 13 mill.; aperture 19 mill. long. (*Pfr.*).

Truxillo, Peru (Cuming).

Bulinus tigris Brod., P. Z. S., 1832, p. 107.—Sowb., Conch. Illustr. f. 21.—*Bulimus trigris* Pfr., Monogr., ii, p. 204; iii, p. 427; iv, p. 489; vi, p. 136.—Reeve, Conch. Icon., pl. 18, f. 107.

"Though approximating very closely to the *B. varians*, there is a sufficient variation in the form of this species to render it distinct.

The body-whorl is of greater length and the aperture effused." (*Rve.*).

D. BUCKLEYI (Sowerby). Pl. 50, figs. 2, 3.

Shell subperforate, elongate, rather thin, shining; buff-whitish, irregularly, sparsely streaked with brown. Spire long, rather obtuse. Whorls 6, a little convex, the last whorl a little exceeding the spire in length, slightly tapering at base. Columella subplicate, obliquely receding. Aperture oblong; peristome simple, expanded, the margins joined by a thin red-brown callus; columellar margin shortly reflexed, nearly closing the perforation. Alt. 27, diam. 9 mill. (*Sowb.*).

Ecuador (Buckley).

Bulimulus (*Drymœus*) *buckleyi* SOWB., Proc. Malac. Soc. Lond., i, p. 214, pl. 13, f. 3, 4, (March, 1895).

Var. *a*. Straw colored, with interrupted brown bands (fig. 2).

Types are in the collection of Mr. S. I. daCosta. The shells were collected by Mr. C. Buckley in 1872, but not mentioned in Mr. Higgin's paper (Proc. Zool. Soc., 1872, p. 685). The form of the shell is about intermediate between *B. fusoides* and *B. castus*. The coloration seems to consist generally of a few more or less faint longitudinal streaks, but one of Mr. daCosta's specimens has interrupted transverse bands. (*Sowb.*).

Group of D. poecilus.

Rather thin, with thin lip, wholly unexpanded or very slightly so. Mainly from Bolivia and Argentina to Ecuador.

D. CONIFORMIS (Pfeiffer). Pl. 51, fig. 21.

Shell subperforate, ovate-conic, thin, irregularly striate; brown-tinted whitish, marked with oblique brown streaks. Spire conic, rather acute. Whorls 5, rather flattened, the last a little longer than the spire, angulated in the middle, subcompressed basally; columella lightly arcuate. Aperture oval, narrowed at each end; peristome simple, unexpanded, the columellar margin dilated above, narrowly reflexed, nearly closing the perforation. Alt. 12, diam. 6½ mill.; alt. of aperture 6½, width 3½ mill. (*Pfr.*).

Merida, Andes of Colombia (Philippi coll.).

Bulimus coniformis PFR., P. Z. S., 1846, p. 114; Monogr., ii, p. 178; vi, 113—REEVE, Conch. Icon., pl. 65, f. 451.

Has the general appearance of a young *B. lobbii*, but is from a different region.

D. OREADES (Orbigny). Pl. 44, figs. 95, 96.

Shell perforate, oblong-conic, thin and fragile. Flesh colored or light yellow, with irregularly spaced purplish-brown longitudinal streaks, which abruptly cease a little way below the periphery, leaving the base immaculate; the streaks often a little spreading at the suture, frequently converging gable-like there. Surface rather glossy, smooth, showing under the lens fine, close spiral striæ. Spire conic, the lateral outlines a trifle convex; apex obtuse; whorls 6½–8, but slightly convex, the sutures shallow, bordered by a white line.

Aperture less than half the shell's length, ovate, slightly oblique, the upper half chestnut, streaked within; peristome thin, sharp and unexpanded, columella straight, subvertical, its edge broadly dilated and reflexed above.

Alt. 24½, diam. 11; alt. aperture 10½ mill. (Piracicaba).

Alt. 32, diam. 12½; alt. aperture 15 mill. (*Pfr.*).

Alt. 32, diam. 14 mill. (*Orb.*).

Near San Roque, prov. Corrientes, Argentina, in a damp forest on the south bank of the river *Santa Lucia* (Orb.); *Piracicaba, prov. S. Paulo, Brazil* (v. Ihering).

Helix oreades ORB., Mag. de Zool., 1835, p. 11; Voy., pl. 31, f. 11, 12.—*Bulimus oreades* ORB., *t. c.*, p. 270.—PFR., Monogr., ii, p. 202; iii, 422; iv, 483; vi, 129.—REEVE, Conch. Icon., pl. 48, f. 313.—*Bulimulus oreades* BECK, Index, p. 65.—*Bulinus sporadicus var.* SOW., Conch. Ill., f. 78.—*Thaumastus oreades* DOERING, Bol. Acad. Cordoba, iii, p. 73.

The color pattern is characteristic, soft stripes of a purplish color, occasionally diverging or gable-shaped, upon a fleshy or yellowish ground.

D. PAZIANUS (Orbigny). Pl. 44, figs. 7, 8.

Shell oblong, pyramidal, a little fusiform, without umbilicus, very thin, diaphanous, fragile, appearing quite smooth to the naked eye, but wrinkled and irregularly marked with growth lines. White or noticeably roseate, especially on the last whorl and at the apex, ornamented longitudinally with narrow and not well defined brown lines. Spire very conic, quite long, acute at apex, composed of 7 closely united whorls, not convex, with inconspicuous suture.

Aperture wide, oblong, the peristome thin and acute; columella narrow, subtruncate below. Alt. 25, diam. 11 mill. (*Orb.*).

Bolivia: Near Cavari, province of Sicasica (typical form) *and on the Rio de Meguilla, between the villages of Lauza and Carcuatu, province of Yungas* (variety), under dead leaves in stony places. (Orb.).

Helix paziana Orb., Mag. de Zool., 1835, p. 12; Voy. Amér. Mérid., pl. 32, f. 10, 11.—*Bulimus pazianus* Orb., *t. c.*, p. 286.—Pfr., Monogr., ii, p. 111; iv, 471; vi, 115.—Reeve, Conch. Icon., pl. 56, f. 377.

Allied to *D. montagnei* and *D. torallyi* but more fusiform, with more acuminate spire, more conic though relatively not so long, etc.

The typical form is imperforate, with the characters described above. A local variety from the *coteaux* of the Rio de Meguilla is distinctly umbilicate, with the aperture less fusiform and a little angular.

Pfeiffer also places here the *Bulimus montagnei* of Reeve (not Orb.). It seems to form a distinguishable variety at least.

Var. *pseudonyma* n. n. Pl. 44, fig. 6.

Shell acuminately oblong, rather thin, scarcely umbilicated; whorls 7, smooth, somewhat rounded; lip simple. Whitish, painted longitudinally with bluish-black dots and streaks; interior of the aperture yellowish. (*Rve.*). Alt. 19 mill. (from fig.).

Chilon, Bolivia, under dead trunks of cacti (Bridges).

Bulimus montagnei Reeve, Conch. Icon., pl. 23, f. 146. Not of Orb.

D. torallyi (Orbigny). Pl. 44, figs. 97, 98, 99, 1, 2, 3.

Shell elongate, pyramidal, quite thick, smooth, glossy, noticeably transparent. Color various: (1) entirely whitish, (2) whitish with the umbilicus and apex blackish, having wide red-brown longitudinal flames, unequally spaced, sometimes represented by series of small spots; these flames, in others form very distinct bands; the interior of the aperture generally brownish. Spire lengthened, with noticeably convex lateral outlines, the apex acute; whorls 8, wide, but little convex, separated by shallow sutures. Aperture small, oblong, subangular; the columellar margin straight and flat; peristome acute. Columella not appressed, but leaving the beginning of a narrow umbilicus. Alt. 31, diam. 11 mill. (*Orb.*).

Provinces of La Laguna and Valle Grande, Bolivia, especially at the place called Pampa Ruiz; along the dry and precipitous coteaux of the Rio Grande; common under stones, cacti and mimosas. (Orb.); *Santa Rosa, province of Salta, Argentina* (Borelli); *Chilon, Bolivia* (Bridges, *B. draparnaudi*); *Eastern Peru* (Bartlett).

Helix torallyi ORB., Mag. de Zool., 1835, p. 11; Voy. Amér. Mérid., pl. 32, f. 1–4.—*Bulimus torallyi* ORB., *t. c.*, p. 285.—PFR., Monogr., ii, p. 201; iii, 412; iv, 471; vi, 114; viii, 152 (excluding *B. sisalensis*).—PARAVICINI, Boll. Mus. Zool. ed. Anat. Comp. Univ. Torino, ix, no. 181, p. 5.—*Bulimulus torallyi* BECK, Index, p. 67.—ANCEY, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, xii, no. 309, p. 5 (1897, as "*B. toralyis*").—*Mesembrinus ventricosus* PARAVICINI, *l. c.*, p. 6.—*B. pazianus* PARAVICINI, *l. c.*, p. 6 (not of Orb.).—*Bulimus draparnaudi* PFR., P. Z. S., 1846, p. 113; Monogr., ii, p. 174. —REEVE, Conch. Icon., pl. 19, f. 116a, b.—*Otostomus torallyi* H. AD., P. Z. S., 1866, p. 435.

D. BORELLII (Ancey). Pl. 26, figs. 77, 78.

Shell elongated, pyramidal, rather solid, opaque, perforate; somewhat shining; pale buff-whitish, irregularly painted with many continuous brown streaks, more or less narrow and nearly straight, with paler ones interposed between them. Spire produced, turrited, tapering-conoid, the apex minute, rather acute. Whorls 9 to 9½, somewhat convex, separated by a linear suture, of little depth, the first whorls pale corneous, one-colored, rather flattened, the following obsoletely striatulate; last whorl oblong, tapering at base.

Aperture oblong, angulate above, hardly expanding, little oblique, the lines showing through; peristome simple, acute, rather broadly revolute for some distance at the perforation, covering the umbilicus above. No parietal callus. (*Ancey*).

Alt. 34, diam. 11, alt. of aperture 11 mill.

Alt. 31, diam. 11, alt. of aperture 10 mill.

Alt. 31, diam. 9, alt. of aperture 9 mill.

Alt. 32, diam. 10½, alt. of aperture 11½ mill.

Mission of San Francisco, on the upper Pilcomayo River (type locality), *and Caiza, in the Gran Chaco, Bolivia; San Lorenzo, prov. Jujuy, Argentine Republic* (Dr. Borelli).

Bulimulus borellii ANCEY, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, xii, no. 309, p. 13, figs. 8, 9 of plate (Nov. 30, 1897).

Mr. Ancey writes substantially as follows: Among species of the same region known to me, none but *B. torallyi* Orb. has strong affinities with *B. borellii*. In the latter the spire is usually much lengthened; but among the varieties of *B. torallyi* found by d'Orbigny there is one shell with the spire almost as long as in normal *B. borellii*, but differing in other characters.

B. borellii is yellowish-white or ochre-tinted, irregularly ornamented with brown rays of greater or less width, and following the growth-lines, narrower and lighter colored rays between them. The shell is duller, less glossy than the specimens I have seen of *B. torallyi*, and the ground color yellower; the perforation, almost open in *borellii*, is reduced to a mere chink, almost completely covered, in *B. torallyi*. The embryonic whorls are densely and very finely punctate.

D. MONTAGNEI (Orbigny). Pl. 44, figs. 12, 13, 14.

Shell elongated, distinctly umbilicate, thin, transparent, smooth. White or distinctly reddish-tinted, ornamented with wide longitudinal brown flames which are spaced and generally lacerated, occupying the posterior two-thirds of the last whorl; the rest of the surface anteriorly is marked with fine, transverse brown lines, which usually appear also between the flames; these intervals in other specimens being speckled or marbled with small, irregular brown spots. Spire lengthened, conic, rather acute at the apex, composed of 6 slightly convex whorls separated by smooth, little impressed sutures. Aperture quite large, oval, rounded, the peristome thin and acute, sometimes showing a tendency to expand; columella arcuate, leaving a wide and deep umbilicus. Alt. 21, diam. 9 mill. (*Orb.*).

Near Petaca, on the slope of the easternmost mountains of the Bolivian Andes, descending to the plain of Santa Cruz de la Sierra, Bolivia, under dead leaves and stones in moist places.

Helix (*Bulimus*) *montagnei* ORB., Voy. Amér. Mérid., pl. 32, f. 5, 6, 7.—*Bulimus montagnei* ORB., t. c. p. 286.—PFR., Monogr., ii, p. 111; iii, 344; iv, 486; vi, 132; viii, 168.—*Bulimus castrensis* PFR., P. Z. S., 1846, p. 115; Monogr., ii, p. 213; iii, 425.—REEVE, Conch. Icon., pl. 59, f. 396.—*Otostomus montagnei* H. AD., P. Z. S., 1866, p. 442.

According to H. Adams, Bartlett collected this species in eastern Peru. It differs from *D. torallyi* in being more conic, shorter, openly umbilicate, thin and fragile, and in the more varied coloration.

D. STIGMATICUS (Philippi). Pl. 49, figs. 68, 69.

Shell subimperforate, ovate-conic, very thin, translucent, painted with close, minute reddish-chestnut dots in transverse series. Whorls 6, little convex, the last equal in length to the exactly conical spire; suture crenulated. Aperture ovate-oblong; columella straightened, peristome unexpanded, very thin, the right margin arcuate, left margin dilated above, almost entirely closing the small perforation. Alt. 16, diam. 9½ mill.; aperture 9 mill. long, 4½ wide (*Phil.*).

"*Hacienda de Unigambal*," *near Cajamarca, Peru* (Raimondi).

Bulimus stigmaticus PHIL., Malak. Bl., xiv, 1867, p. 74.—PFR., Novit. Conch., p. 337, pl. 80, f. 12, 13; Monogr., vi, p. 113.

As in many other species, the umbilical perforation is bounded by a reddish band. Seems to approach *B. nivalis* Orb., according to Philippi, but differs in coloration, the exactly conic spire, more acute apex and almost completely flat whorls. The very delicate striæ pass into folds at the suture, which is crenulated by them.

D. MILIARIS (Philippi). Pl. 48, figs. 41, 42.

Shell subperforate, oblong-conic, very thin, very smooth, translucent; rufous-corneous, with close, narrow streaks and blotches of milk white. Whorls 6, a little convex, the last forming three-sevenths the shell's length. Aperture ovate; columella straightened; peristome simple, unexpanded, very thin; right margin strongly arcuate, columellar margin moderately dilated, half covering the umbilical chink. Alt. 15, diam. nearly 8 mill.; aperture 7 mill. long, 4 wide (*Phil.*).

"*Hacienda de Unigambal*," *near Cajamarca, Peru* (Raimondi).

Bulimus miliaris PHIL., Malak., Bl., xiv, 1867, p. 74.—PFR., Novit. Conch., p. 347, pl. 81, f. 19–21; Monogr., vi, p. 115.

Like *B. nivalis* Orb. and *stigmaticus* Phil. in size and tenuity, but more lengthened with longer spire. The milky streaks are somewhat elevated.

D. CLATHRATUS (Pfeiffer).

Shell compressed, umbilicated, fusiform-oblong, rather thin, plicatulate, slightly shining; whitish, somewhat latticed (subclathrate) with narrow, interrupted, brown streaks and bands. Spire lengthened, the apex rather acute. Whorls 8, little convex, the last slightly exceeding two-fifths the length of shell, compressed at base. Aperture scarcely oblique, subrhombic-oval; columella lightly

twisted in the middle; peristome simple, unexpanded, the columellar margin dilated basally, broadly spreading above. Alt. 30, diam. 11 mill.; aperture 12½ mill. long, 6 wide (*Pfr.*).

Province of Patas, Peru (Dr. Farris, in Cuming coll.).

Bulimus clathratus Pfr., P. Z. S., 1858, p. 258; Malak. Bl., 1859, p. 47; Monogr., vi, p. 134.

D. confusus (Reeve). Pl. 45, fig. 32.

Shell perforate, turrited-oblong, solid, longitudinally closely wrinkle-striate; brown-tinted whitish. Spire long-conic, the apex a little acute, marbled with corneous. Suture impressed, sub-crenulate. Whorls 5½, rapidly increasing, the upper ones rather flat, last whorl shorter than the spire, attenuated at base. Columella receding, subplicate above. Aperture oval-oblong, dull fleshy within; peristome simple, thin, acute, the margins subparallel, columellar margin dilated above, reflexed, overhanging. Alt. 28, diam. 11 mill.; aperture 13 mill. long (*Pfr.*).

Peru.

Bulimus confusus Reeve, Conch. Icon., pl. 48, f. 316 (Nov. 1848).—Pfr., Monogr., iii, p. 426; Conchyl. Cab., p. 220, pl. 61, f. 5, 6.—(? *Bulimus culmineus* Reeve, Conch. Icon., pl. 54, f. 360, according to Pfr.)

Compared by Reeve with *B. torallyi* Orb.

D. monachus (Pfeiffer). Pl. 51, figs. 22, 23.

Shell narrowly perforate, oblong-turrited, thin, striatulate, diaphanous, dull corneous. Spire convex-turrited, the apex rather acute. Whorls 7½, scarcely convex, the last about three-sevenths the total alt., the base little attenuated, rotund. Columella receding. Aperture oblique, oblong-oval; peristome simple, unexpanded, columellar margin dilated and reflexed above. Alt. 31, diam. 11½, alt. of aperture 14½ mill. (*Pfr.*).

Moyobamba, Peru (Gueinzius).

Bulimus monachus Pfr., P. Z. S., 1856, p. 333; Monogr., iv, p. 504; Novit. Conch., p. 493, pl. 106, f. 9, 10.

D. canarius ('Philippi' Pfeiffer). Pl. 48, figs. 36, 37, 38.

Shell subcompressed-umbilicate, subfusiform-elongate, rather solid, very lightly striated, a little shining, whitish and streakedly variegated with fleshy; spire turrited, the apex acute; suture shallow, whitish. Whorls 8, a trifle convex, the last about two-fifths the

total length, attenuated at base and subcompressed. Aperture subvertical, acuminate-oblong; peristome simple, thin, the right margin unexpanded, columellar margin lightly arcuate, dilated above, reflexed, overarching the umbilicus. (*Pfr.*).

Alt. 31, diam. 11 mill.; aperture 12½ mill. long, inside 5⅔ wide.

Alt. 37, diam. 12 mill.; aperture 16 mill. long, inside 6 wide.

Trujillo, Peru (Raimondi).

Bulimus canarius Phil. (label), Pfr., Malak. Bl., xiv, 1867, p. 76; Novit. Conch., p. 334, pl. 80, f. 5–7; Monogr., vi, p. 129.

D. morbidus (Philippi). Pl. 48, figs. 45, 46.

Shell umbilicate-perforate, oblong-turrited, rather smooth, thin; whitish, the apex yellow. Whorls 7, rather flat, the embryonal very smooth, last whorl three-sevenths the shell's length, appressed above. Aperture somewhat oblong; columella perpendicular, rather straightened, compressed; peristome thin, subreflexed, especially at the upper part; columellar lip triangularly dilated above. Alt. 32, diam. 14 mill.; aperture 14 mill. long, 6½ wide. (*Phil.*).

"*Hacienda de Sunchobamba*" *near Cajamarca, Peru* (Raimondi).

Bulimus morbidus Phil., Malak. Bl., xiv, 1867, p. 70.—Pfr., Novit. Conch., p. 341, pl. 81, f. 5, 6 (not f. 3, 4); Monographia, vi, 50.

D. chenui (Philippi). Pl. 48, figs. 47, 48.

Shell subperforate, oblong-conic, solid, striatulate, whitish [or very pale tawny, covered with a pale olivaceous cuticle]. Whorls 6, a little convex, the last hardly as long as the spire. Aperture ovate; peristome simple, rather thick, columellar margin reflexed, nearly covering the umbilical chink. Alt. 29, diam. 16½, alt. of aperture 13, width inside 7 mill. (*Phil.*).

Pachicamac, near Lima, Peru (Phil., Isern.).

Bulimus chenui Phil., Malak. Bl., xiv, 1867, p. 72.–Pfr., Novit. Conch., p. 344, pl. 81, f. 11, 12; Monogr., vi, 146.—Hidalgo, Journ. de Conch., 1870, p. 58; Viaje al Pacifico, p. 113.

Philippi described dead specimens, Hidalgo supplementing his description of the color from specimens collected by Isern. He further notes that some granulation appears on the longitudinal striæ under strong magnification, and gives the dimensions, alt. 27, diam. 13 mill.

D. SUBROSEUS (Philippi). Pl. 49, figs, 61, 62, 63, 64.

Shell openly umbilicate, ovate-conic, rather solid and rather smooth or delicately striatulate; rose-whitish, unicolored or marked with very faint, obsolete, violet bands. Spire conic, the apex acute, buff; suture slight. Whorls 7, slightly convex, the last a little shorter than the spire, subangularly compressed near the umbilicus; columella somewhat receding. Aperture slightly oblique, oblong, subeffuse at the base of the columella, but not angulate, fleshy-brown inside; peristome whitish, the right margin scarcely expanded above, moderately so outwardly, the columella dilated and spreading above. Alt. 29, diam. 12 mill.; aperture (including peristome) 14 mill. long, 8 wide. (*Pfr.*).

Between S. Fernando and Patipampa, Peru.

Bulimus subroseus Phil., PFR., Malak. Bl., xvi, p. 90 (1869); Novit. Conch., p. 472, pl. 102, f. 12, 13; and *var.*, f. 14, 15 (*B. pœcilus* Orb. var.?, on plate); Monogr. Hel. Viv., viii, p. 64.

Var. (pl. 49, figs. 63, 64). Shell a little more obese, marked with interrupted brown lines above, more distinct bands on the last whorl. Alt. 29, diam. 13 mill. (*Pfr.*).

Pfeiffer notes that this is somewhat similar to the figures of *B. serotinus* Morel., but the shell is rather solid, opaque, not corneous; aperture wider, not angulate at base, peristome more widely expanded. The variety is not very unlike *B. pœcilus* Orb., with which Philippi compares it, but the aperture and peristome differ widely from that species.

D. NIGROAPICATUS (Pfeiffer).

Shell perforate, ovate-conic, rather thin, striate, shining; whitish, ornamented with close blackish bands, the upper ones moniliform. Spire conic, the apex rather acute, black. Whorls 5½, little convex, the last a little longer than the spire, ventricose. Columella very slightly arcuate. Aperture oblique, elliptical-oval; peristome simple, not expanded, the columellar margin widely dilated and subappressed above. Alt. 22, diam. 11½; alt. of aperture 13, width nearly 7 mill. (*Pfr.*).

"*Rio Pampas,*" *Peru* (Castelnau in Cuming coll.).

Bulimus nigroapicatus PFR., P. Z. S., 1856, p. 333; Monogr., iv, p. 478.

Like *B. tumidulus* (Vol. X, p. 168) in form and bands; differing in the distinct striation, non-mucronate apex, etc. (*Pfr.*).

D. ALSOPHILUS (Philippi). Pl. 49, figs. 71, 72.

Shell perforate-umbilicate, oblong-turrited, thin, smooth; ashy-whitish, with subtessellated reddish-chestnut bands, two on the upper, 5 on the last whorl. Whorls 8, a little convex, the last nearly two-fifths the length of shell; apex acute. Aperture ovate-oblong, the peristome unexpanded, thin, right margin subsinuous above, columellar margin expanded above; columella somewhat arcuate. Alt. 30½, diam. 14; aperture 13 mill. long, 7 wide. (*Phil.*).

Between Lamas and Tarapoto, Peru (Raimondi).

Bulimus alsophilus PHIL., Mal. Bl., xiv, 1867, p. 69.—PFR., Novit. Conch., p. 334, pl. 80, f. 3, 4; Monogr., vi, p. 130.

This species closely resembles *B. sachsei* Alb., but is easily distinguished by the form of the aperture, the coloration, and the much shorter and broadly reflexed columella of *sachsei*. (*Pfr.*).

D. SERENUS (Philippi). Pl. 49, figs. 73, 74.

Shell imperforate, oblong-turrited, slightly striatulate, thin, very glossy; white, with three reddish-chestnut zones on the last, two on the earlier whorls; apex obtuse. Whorls 7, flat, the last narrowed at base, forming two-fifths of the shell's length. Aperture oblong; columella perpendicular; peristome unexpanded, the right margin very oblique, columellar margin triangular, dilated above, adnate; no inner lip. Alt. 28, diam. nearly 12; aperture 12¼ mill. long, 5½ wide. (*Phil.*).

Hacienda de Sunchobamba, Peru (Raimondi).

Bulimus serenus PHIL., Mal. Bl., xiv, 1867, p. 72.—PFR., Novit. Conch., p. 339. pl. 80, f. 19, 20; Monogr., vi, p. 106.

An isolated species among the other Peruvian Bulimi. The embryonal whorls are flesh colored above, purple-black below.

D. POECILUS (Orbigny). Pl. 49, figs. 49–57.

Shell ovate-pyramidal, thin, but moderately strong, rather openly perforate. Opaque-white (rarely yellowish), variously banded with black-brown: (*a*) with 7 continuous narrow bands, that below the suture widest, fig. 51; (*b*) the bands above the periphery broken into square or oblong chestnut and black spots, the three basal bands continuous, or the middle one or all of them interrupted, figs. 49, 50; (*c*) bands above periphery transformed into obliquely longitudinal stripes and blotches, some chestnut, some blackish; and

finally the introduction of red in some specimens produces further patterns, appearing usually as a columellar patch, sometimes also as a band below the periphery between two dark bands, and sometimes generally spread in bands and oblique streaks upon the body whorl, the blackish bands subobsolete. Surface glossy, showing slight growth-lines and faint, fine spiral striation. Spire straightly conic, apex slightly obtuse, 1⅔ earlier whorls with typical *Drymæus* sculpture. Whorls 6½–7, somewhat convex.

Aperture quite oblique, ovate, less than half the shell's length, colored within like the outside; peristome thin and acute, unexpanded; columella concave, straightened above, the margin broadly dilated above and reflexed.

Alt. 30, diam. 14½; alt. of aperture 14⅓ mill.

Alt. 33, diam. 16; alt. of aperture 15⅓ mill.

Province of Matto Grosso, Brazil, west to the eastern foothills of the Bolivian Andes, south to the Sierra de Catamarca, Argentina.

Helix (*Cochlogena*) *pœcila* Orb., Mag. de Zool., 1835, p. 11; Voy. Amér. Mérid., pl. 31, f. 1–10.—*Bulimus pœcilus* Orb., Voy., p. 268.—Pfeiffer, Monogr., ii, p. 200; iii, p. 420; iv, p. 481; vi, p. 128.—Reeve, Conch. Icon., pl. 16, f. 91.—Paravicini, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, ix, no. 181, p. 6.—? Lubomirski, P. Z. S., 1879, p. 725 (see below).—*Bulinus pœcilus* Sowb., Conch. Illustr., f. 68, 69.—*Bulimus prœcilus* Anton, Verzeichniss, p. 41.—*Bulimulus pœcilus* Beck, Index Moll., p. 65.—Ancey, Journ. of Conch., Leeds, vii, p. 92; Boll. Mus. Zool. ed Anat. Comp. Torino, xii, no. 309, p. 5, 12 (1897)—Martens, Conchol. Mittheil., ii, p. 13, pl. 40, f. 1–5.—*Otostomus* (*Mesembrinus*) *pœcilus* Orb., Doering, Bol. Acad. Nacional. Cien. Rep. Argent., iii, p. 76 (1879).

Bulimus pictus Bonnet, Rev. et Mag. de Zoologie, (2), xvi, p. 69, pl. 5, f. 4–6, pl. 6, f. 1 (March, 1864).—? *Bulimus pictus* Pfr., P. Z. S., 1854, p. 58; Monographia, iv, p. 483.

D'Orbigny distinguishes two varieties: *major*, alt. 35, diam. 18 mill., inhabiting the valleys of the easternmost foot hills of the Bolivian Andes before descending to the plains of Santa Cruz de la Sierra, especially at the bridge of Tasajos and the town Pampa Grande, on the plains bordering the river Pampa Grande. Var. *minor*, alt. 28, diam. 16 mill. has also special localities for its several subvarietal forms. That with 7 distinct bands belongs in the great

forests along the Rio Grande between Santa Cruz de la Sierra and Chiquitos; other subvarieties occur to the east in the forests along the Rio Tucabaca between San Juan and Santo Corazon de Chiquitos.

The red-variegated (together with all of the others except "var. *major*") occur abundantly in the province of Matto Grosso, Brazil, around Corumbá (pl. 49, figs. 49–52). I do not doubt that Bonnet's *B. pictus* came from this locality, although he gives "Peru" as the habitat.

Special localities on record are: Brazil, Corumbá, prov. Matto Grosso, abundant in dry woods on trees, especially palms (Herbert H. Smith); Bolivia, Mission of San Francisco, on the upper Pilcomayo; (Borelli); Argentina, Caiza, in the Chaco region; Tala, prov. Salta; San Lorenzo, prov. Jujuy; San Pedro, Santa Rosa, Rio Apa (Borelli); Sierra de Catamarca (Brackebusch & Hieronymus).

Ancey separates as var. *icterica* specimens with rather solid, oblong-attenuated shell, dull yellow with the suture of the last whorl and the umbilical area lilac. Alt. 29, diam. 13, length of aperture 14 mill. The variety was based upon two individuals. It is represented in the series before me, but so far as I see can hardly be accorded varietal rank without similarly recognizing a good many of the other variations also.

As to the specific identity of *B. pictus* Pfr. with *pœcilus* I am not certain. If the locality "Peru" be correct, it is doubtful; but on the other hand, Pfeiffer himself identifies his *pictus* with Bonnet's species of the same name, which is unquestionably *pœcilus*. The same doubt attaches to Prince Lubomirski's doubtful determination of numerous specimens collected at Chota, Peru, by Stolzmann, exhibiting great variation in color. Compare *mexicanus* var. *primularis*.

D. INTERPUNCTUS (Martens). Vol. XII, pl. 5, figs. 4, 5.

Shell perforate, conic-oblong, thin, very delicately spirally striated; pale yellow, with widely separated vertical series of brown spots, and on the base two bands, the suture narrowly white, apex pale brownish. Whorls 7, nearly flat, the last rounded at base. Aperture rather broadly ovate, columella arcuate, white, columellar margin narrowly reflexed; outer lip thin, only a trifle expanded. Alt. 24, diam. 11; aperture 11 mill. long, 8 wide. (*Martens*).

Piracicaba (Nehring), *Iguape and Piquette* (von Ihering), *prov. Sao Paulo, Brazil.*

Bulimulus interpunctus Mts., Sitzungsberichte Ges. naturf. Freunde, Berlin, 1886, p. 161; Conchol. Mittheil., ii, p. 14, pl. 40, f. 6, 7.

Of the numerous South American species of *Bulimulus*, *B. maculatus* Lea comes nearest to the present species in marking; but that is less slender and pointed, as well as diverse in sculpture and color. (*Martens*).

The spots are sometimes more or less confluent vertically, and the upper of the two basal bands may be broken into oblong spots. Dr. von Ihering has found it at various localities and it seems to be not uncommon in the province of Sao Paulo. Although resembling *semimaculatus*, *semifasciatus* and *virgo* in color-pattern, *D. interpunctus* is probably on offshoot from the *D. pœcilus* stock.

D. SUBPELLUCIDUS (Smith). Vol. XII, Pl. 5, fig. 1.

Shell fragile, subpellucid, narrowly perforate, long conic, shining, corneous; transversely obsoletely striated, and sculptured with oblique growth-lines. Whorls 7, a little convex, separated by a minutely crenulated suture. Aperture little oblique, ovate, three sevenths the length of the shell; columella a little straightened above, slightly arcuate; peristome thin, moderately expanded throughout, yellowish externally and within, the margin white; columellar margin dilated. Alt. 23, diam. 9; aperture 10 mill. long, 4½ wide inside. (*Smith*).

Ecuador.

Bulimus (*Liostracus*) *subpellucidus* E. A. Smith, P. Z. S., 1877, p. 364, pl. 39, f. 2.

"This simple species is chiefly characterized by its thin texture, horny color, and the yellowish tint of the peristome, the extreme edge of which is whitish."

D. FLAVIDULUS (Smith). Vol. XII, Pl. 5, fig. 2.

Shell deeply rimate or perforate, ovate-pyramidal, thin, semipellucid, shining, most minutely spirally, closely striated; yellowish, ornamented with series (3 on the upper, 5 on the last whorl) of squarish brown spots. Spire long, conic, with slightly convex lateral outlines, apex yellowish. Whorls 7, a little convex, slowly increasing, separated by a narrow pale suture. Aperture slightly oblique, oval, a little exceeding three-sevenths the length of shell; peristome thin, the right margin very narrowly (scarcely) expanded, columellar

margin narrowly dilated and reflexed. Alt. 21, diam. 9; alt. of aperture 8½, width 5 mill. (*Smith*).

Zaruma, South Ecuador.

Bulimus (*Liostracus*) *flavidulus* E. A. Smith, P. Z. S., 1877, p. 364, pl. 39, f. 3.

This pretty delicate species is easily recognized by its style of coloration. The transverse series of squarish spots, which are somewhat distant from each other, are very constant. They are not equally remote from one another, but sometimes three or four spots are quite close together and thus form a short almost continuous transverse band; this is particularly the case with the two basal bands on the body-whorl. As the shell is so thin and semitransparent, all the markings are visible within the aperture. The two apical whorls under a strong lens are seen to be minutely granulated, as is the case in many other species. *B. ziegleri* of Pfeiffer, var. *β*?, Mon. Hel., ii, p. 175; and *B. maculatus* Lea (?=*B. maculatus* Rve.), have similar styles of marking. (*Smith*).

D. fuscobasis (Smith). Vol. XII, Pl. 5, fig. 3.

Shell narrowly perforate, long-conic, thin, semipellucid, shining; white, ornamented with transverse more or less interrupted brown bands, 2 on the upper, 3 on the last whorl. Minutely striated spirally throughout. Whorls 7 to 8, perceptibly increasing, a little convex, the last with a scarcely interrupted basal band. Spire long, the apex little acute, blackish. Aperture slightly oblique, white inside, the bands showing through, about two-fifths the length of the shell; peristome thin, scarcely expanded, the columellar margin reflexed. Alt. 29, diam. 12; aperture 11 mill. long, 6½ wide. (*Smith*).

Tarapoto, Andes of Peru (Spruce, in Cuming coll.).

Bulimus (*Liostracus*) *fuscobasis* Smith, P. Z. S., 1877, p. 365, pl. 39, f. 6.

This species was labelled in Cuming's collection as *B. lividus* Reeve. On comparing the two specimens of it with the types of that species, I find certain characters which cannot be reconciled with Reeve's shell. The form and proportion of the whorls are different, also the length of the spire is greater in the present species, and its black apex and banding are good specific distinctions. The transverse bands in *B. fuscobasis* consist of elongate stripes, whilst in *B. lividus* the bands take more the form of quadrate spots widely separated.

B. rectilinearis Pfeiffer, is also allied to the present species; but it is more sharply conical, shows but the faintest traces of spiral striation, has not a black apex, is differently banded, and the columellar and umbilical characters are not similar.

D. MILTOCHROUS (Albers). Pl. 48, figs. 28, 29.

Shell compressed-umbilicate, ovate-turrited, rather thin, smooth, shining. *Brownish brick colored with two black, white streaked bands, one at the suture, the other at the base, and one white girdle below the periphery.* Spire turrited, rather acute. Whorls 7, a little convex, the last three-sevenths the total length of the shell, slightly tapering at base. Aperture slightly oblique, truncate-oblong; peristome simple, the right margin a trifle expanded, spreading above, the columellar margin membrane-like, very much dilated above. Alt. 31, diam. 13 mill.; aperture 14 mill. long, 7½ wide (*Pfr.*).

Upper course of the Maranon River, in Peru (or Ecuador) (Warszewicz).

Bulimus miltochrous ALB., Malak. Bl., i, 1854, p. 217—PFR., Novit. Conch., i, p. 36, pl. 10, f. 3, 4; Monogr., iv, p. 403.

D. VESTALIS (Albers).

Shell perforate, ovate-oblong, solid, lightly striatulate, opaque, chalky; spire conic, the apex acute, roseate. Whorls 8, the upper flattened, those following more convex, the last whorl forming three-sevenths the total alt. of shell, tapering at base and areolate with lilac. Aperture little oblique, truncate-oval; peristome acute, rose-lipped within, the right margin unexpanded, columellar margin lilac-colored, thin, shining, reflexed and overhanging. Alt. 19, diam. 9; alt. of aperture 8½, width 4⅔ mill. (*Pfr.*).

On the Maranon River, "Colombia" (Warscewicz).

Bulimus vestalis ALB., Malak., Bl., i, p. 218 (1854).—PFR., Monogr., iv, p. 498.

D. ANCEPS (Albers). Pl. 49, figs. 66, 67.

Shell narrowly perforate, subfusiform-oblong, rather solid, longitudinally plicatulate; pale buff, ornamented with brown spots arranged in bands and streaks, obsolete on the last whorl. Spire a little convexly turrited, sub-acute. Whorls 7, moderately convex, the last forming three-sevenths the total length, somewhat tapering at base. Columella rather straight, receding. Aperture slightly

oblique, ovate-elliptical; peristome simple, the right margin unexpanded, lightly arcuate, columellar margin white, widely reflexed above. Alt. 26–28½, diam. 10 mill.; aperture 11½ mill. long, 5½ wide (*Pfr.*).

Maranon River, "Colombia" (Warscewicz).

Bulimus anceps ALB., Malak. Bl., i, p. 217 (1854).—PFR., Novit. Conch., i, p. 43, pl. 11, f. 13, 14; Monogr., iv, p. 489.

D. HEPATICUS (Albers). Pl. 49, figs. 75, 76.

Shell umbilicate, ovate-turrited, rather solid, irregularly rugose-striate; bluish-chestnut with one or several white bands. Spire turrited, acute. Whorls 8, a little convex, the last rotund, two-fifths the length of the shell. Aperture slightly oblique, oval; peristome simple, the margins somewhat approaching, right margin unexpanded, chestnut-edged, white-calloused inside; columellar margin dilated above, spreading. Alt. 25, diam. 10½; aperture 10 mill. long, 5 wide (*Pfr.*).

Maranon River "Colombia" (Warscewicz).

Bulimus hepaticus ALBERS, Malak. Bl., i, p. 218 (1854).—PFR., Novit. Conch., i, p. 57, pl. 16, f. 13, 14; Monogr., iv, p. 491.—? MOUSSON, Malak. Bl., xvi, p. 177.

D. LIBERTADENSIS Pilsbry, n. n. Pl. 51, figs. 16, 17.

Shell perforate, ovate-fusiform, striatulate, rather thin; whitish, ornamented with 5 to 6 reddish-chestnut bands, the upper ones ragged. Spire conic, acute; whorls 7, moderately convex, the last as long as the spire. Columella straight, not receding. Aperture oblong; peristome simple, a trifle expanded, the columellar margin dilated, reflexed, elongate. Alt. 32½, diam. 17½ mill.; aperture 17 mill. long, 9 wide (*Phil.*).

"Hacienda de Mariebal," dept. Libertad, Peru (Raimondi).

Bulimus tæniatus PHIL., Malak. Bl., xvi, 1869, p. 35.—PFR., Novit. Conch., iii, p. 468, pl. 102, f. 3, 4; Monographia, viii, p. 58. Not *B. tæniatus* Mörch, 1850.

A single specimen seen; striæ quite conspicuous; apex pale violaceous; on the upper whorls there are three lacerated bands, the other three, which appear on the base of the last whorl, are continuous and darker, the lowest encircling the umbilicus (*Phil.*).

D. MEXICANUS (Lamarck). Pl. 49, fig. 58.

Shell narrowly umbilicate, ovate-turrited, rather thin, nearly smooth; white, ornamented with blackish or chestnut bands crossed

by white lines, generally few in number, on the base. Spire long-conic, rather acute; whorls 7, a little convex, the last about three-sevenths the total alt., rounded at base; columella rather straightened. Aperture a little oblique, truncate-oval; peristome simple, unexpanded, the right margin regularly arcuate, columellar margin dilated above, reflexed. Alt. 31, diam. 15; alt. of aperture 15 mill. (*Pfr.*).

On the Maranon River, northern Peru.

Bulimus mexicanus LAM., An. s. Vert., vi, p. 123 (1822).—VALENCIENNES, Rec. Obs. Zool., etc., ii, p. 247, pl. 56, f. 1 (1833).—DELESSERT, Rec. de Coquilles, pl. 27, f. 9 (1841).—Not *Bulimus mexicanus* Reeve, 1848; *cf.* Crosse & Fischer, Moll. Terr. Mex., i, p. 541, and v. Martens, Biol. Centr. Amer. Moll., p. 251.—*Helix* (*Cochlogena*) *vittata* Humboldt, FER., Tabl. Syst., p. 54, no. 397 (no description).

Bulimus humboldtii REEVE, Conch. Icon., pl. 58, f. 391 (Jan., 1849).—PFR., Monogr., iii, p. 415; iv, 482; vi, 128; viii, 165.

? "*Bulimus* (*Mesembrinus*) *pœcilus* d'Orb.?" LUBOMIRSKI, P. Z. S., 1879, p. 725 (numerous color varieties described, from Chota, Peru).

It has long been recognized that the original *B. mexicanus* of Lamarck (figured in Delessert's folio), is not a Mexican shell, but identical with *B. humboldtii* of Reeve, the *B. mexicanus* of the latter author being a totally different thing.

The typical form of *mexicanus* has three dark basal girdles interrupted by fine white lines. Whether *B. primularis* deserves varietal recognition or not I do not know, having seen no specimens.

Var. *primularis* Reeve. (Pl. 49, figs. 59, 60).

Shell perforate, ovate-turrited, rather thin, nearly smooth; yellowish-white, ornamented with two wide black bands below the middle and one interrupted median and another basal band of chestnut. Spire long-conic, rather acute. Whorls 7, a little convex, the last about three-sevenths the length, rotund at base; columella rather straightened. Aperture little oblique, truncate-oval; peristome simple, unexpanded, the right margin regularly arcuate, columellar margin dilated above, vaultingly reflexed. Alt. 29, diam. 14; alt. of aperture 13 mill. (*Pfr.*).

Chachapoyas, Peru (Lobb); *Utcubamba River, north-eastern Peru* (Stübel).

Bulimus primularis REEVE, P. Z. S., 1849, p. 100; Conch. Icon., pl. 73, f. 527.—PFR., Monogr., iii, p. 421.—*Bulimulus primularis* BINNEY, Ann. Lyc. N. H., N. Y., ix, p. 37, pl. 1, f. vii (dentition).—*Mesembrinus primularis* BINNEY, Ann. N. Y. Acad. Sci., iii, p. 122, pl. 12, f. G (dentition).—*Otostomus* (*Mesembrinus?*) *humboldti* var. *primularis* MARTENS, Conchol. Mittheil., p. 161.

D. SEROTINUS Morelet. Pl. 49, fig. 70.

Shell umbilicate, ovate-acuminate, *thin, rather smooth, subpellucid, corneous-gray or corneous tawny, flamed with serrate white streaks, and encircled below the middle of the last whorl by several bands.* Spire conic, acute; whorls 7, little convex, the last attenuated at base, compressed around the perforate umbilicus; *columella nearly straight*, or a little receding.

Aperture semi-oval, *angular below*, showing the external coloring within; peristome thin, the right margin arcuately expanded, lightly white-calloused; the columellar margin dilated, broad (*Morel.*).

Alt. 26, diam. 10½ mill.

Alt. 32, diam. 12 mill. (more solid, larger form).

Valleys of Andahuayles, Abancay and Chupan, Peru, in green oasis at the valley bottoms (Angrand).

Bulimus serotinus MOREL., Journ. Conch., 1860, p. 374; Sér. Conch., iii, p. 207, pl. 11, f. 5.—PFR., Monogr., vi, p. 79.

It is a thin and fragile, smooth and shining shell, remarkable for the style of coloring, which consists of a corneous ground of a fawn or grayish tint, upon which are white flammules, generally denticulate, intermingled with irregular little spots of the same color. Sometimes, especially when the ground-tint is quite light, these flammules produce a sort of cloudiness, comparable to the shades of agate. On the lower portion of the last whorl these markings are transformed into numerous narrow bands, which predominate to the base and surround the umbilicus. In certain individuals the flammules reappear at the extremity of the last whorl.

D. LONGINQUUS (Morelet). Pl. 50, figs. 93, 94.

Shell narrowly umbilicated, oblong-turrited, thin, irregularly striate; whitish, ornamented with brown streaks and somewhat interrupted basal bands; spire lengthened, acute. Whorl 7 to 8, a little convex, the last rounded at base, five-sixths the length of the spire. Aperture slightly oblique, oblong-oval, showing the streaks

and bands through ; peristome thin, the margins approaching, right margin somewhat expanded, columellar margin dilated, conspicuous. Alt. 31, diam. 12 mill. (*Morel.*).

Western slope of the Vilcanote chain, Peru : frequent in the Urubamba Valley ; at Limatambo, Ollantaitambo and *Yucay ;* the white variety at *Piré*, a colder locality in the same mountain chain (Angrand).

Bulimus longinquus MORELET, Séries Conchyliologiques, iii, p. 195, pl. 11, f. 2 (April, 1863).

Morelet mentions a unicolored, white form (fig. 93), and another latticed with bands and streaks of purple-brown.

It is not without some resemblance to *B. pœcilus*, at least in form, the coloration differing. It is very constant in proportions, composed of 7, rarely 8, whorls. The long spire tapers gradually toward the apex, which is acute and nearly always colorless. The most variable part of the shell is the umbilicus, which is usually quite open, but sometimes reduced to a mere fissure. The straight and simple peristome shows a perceptible tendency to expand toward the base. The shell is thin, though not without some degree of solidity. It is superficially and quite unequally engraved with striæ, ornamented on a whitish ground with oblique, reddish-brown lines, sometimes regularly spaced, sometimes partially effaced ; and there are also commonly five or six narrow, frequently interrupted bands on the basal moiety of the last whorl.

B. longinquus differs from *pœcilus* in having the spire a little more slender, the aperture narrower, fawn colored inside, the peristome with a tendency to expand, and with convergent insertions; finally in the color pattern.

It inhabits a climate suitable for the culture of maize, while *B. virgultorum* (Vol. X, p. 168) lives on the eastern slope of the same mountain chain, some 400 or 500 meters lower down, in the coffee tree region. It occurs on cacti and spiny plants.

D. VIRGULTORUM (Morelet). Vol. x, p. 168.

This species, included in *Lissoacme*, is probably a *Drymæus*. Morelet gives the localities Corihuairachina, Urubamba, Calca, Sicuani, Talavera and the adjacent valleys of La Paz and Chuquisaca. The mineral constitution of the region is similar to that described under *D. longinquus*, but the soil is deeper, supporting a richer vegetation. The shell is thinner than *D. longinquus*, more

polished and glossy, the coloring brighter and more diversified, responding to the tropical aspect of the flora.

Probably B. DENDRITIS Morelet (Vol. X, p. 186) is a *Drymæus* allied to the foregoing species.

D. BICOLOR (Sowerby). Pl. 49, fig. 65.

Shell oblong, subacuminate above; pallid, *with interrupted brown bands.* Whorls 5, subventricose, the last larger; umbilicus small. Aperture subovate, acuminate behind; peristome thin, subacute. Alt. 0·9, diam. 0·4 inch (*Sowb.*).

Province Xagua, Peru (D. Matthews); *Banks of Ucayali River, Ecuador* (Orton).

Bulinus bicolor SOWERBY, P. Z. S., 1834, p. 141.—*Bulimus bicolor* PHIL., Abbild. u. Beschreib., ii, p. 113, *Bul.*, pl. 4, f. 8.—REEVE, Conch. Icon., pl. 44, f. 276.—PFR., Monogr., ii, p. 198; viii, p. 163.—CROSSE, Journ. de Conchyl., 1871, p. 317.

Pfeiffer, in *Monographia*, iii, p. 419; iv, p. 479; vi, p. 126, and viii, p. 163, considers *B. polymorphus* Orb. the same. I have seen neither species, and have described *polymorphus* as a *Scutalus* (p. 28). Being ignorant of the apical sculpture, I can express no opinion upon the systematic position of either species. "The lower edge of the bands is peculiarly broken or serrated," according to Reeve.

D. PAETELI (Albers).

Shell perforate, ovate-conic, thin, rather smooth; yellowish-white, ornamented with *four purple-brown bands.* Spire conic, acute. Whorls 6½, rather flat, the last scarcely longer than the spire, somewhat tapering at base. Aperture oblique, oblong-oval, buff, banded with chestnut inside; peristome thin, a little expanded, the right margin lightly arcuate, columellar margin membranaceous, widely reflexed above, conspicuous, somewhat excavated. Alt. 25, diam. 10½, length of aperture 14, width inside 7 mill. (*Pfr.*).

On the Maranon River (Albers coll.).

Bulimus paeteli ALB., Malak. Bl., 1854, p. 31.—PFR., Monogr., iv, p. 398.

An unfigured species from "*ad fluvium Maranhon in confinibus Columbiæ;*" but this refers probably to the former wide extension of Colombia southward.

D. KEPPELLI (Pfeiffer).

Shell narrowly umbilicate, ovate-oblong, rather thin, smoothish (irregularly striolate) and rather shining. Spire long-conic, the apex rather acute, white. Whorls 7, a little convex, the upper white with two red bands, the last forming two-fifths of the total length, somewhat plicate at the suture, the base subattenuated, *smoky brown, encircled by 3 or 4 red bands with pale edges, irregularly bestrewn with pale dots.* Columella rather straightened. Aperture little oblique, narrow, oblong; peristome simple, the right margin lightly arcuate, unexpanded, columellar margin dilated in a wide triangular lamina. Alt. 34½, diam. 14, alt. of aperture 15, width 7 mill. (*Pfr.*).

Andes of Peru (Keppell, in Cuming coll.).

Bulimus keppelli PFR., P. Z. S., 1853, p. 50; Monogr., iii, p. 654.

D. CERUSSATUS (Reeve). Pl. 50, fig. 79.

Shell acuminately oblong, rather largely, compressly umbilicated. Whorls 7 in number, convex, smooth; columella very broad, scarcely reflected. Aperture rather obliquely produced; lip simple. Chalk-white, painted interiorly with a few brown, waved streaks, which show somewhat obscurely through the substance of the shell (*Reeve*).

Habitat unknown.

Bulimus cerussatus REEVE, Conch. Icon., pl. 74, f. 536, species 537 (August, 1849).

Pfeiffer unites this to *B. annulatus* as a variety. If specifically the same, *cerussatus* has priority.

D. ANNULATUS (Reeve). Pl. 50, fig. 78.

Shell umbilicate, turrited-oblong, rather solid, striatulate, under the lens showing close, decussating spiral lines; whitish, ornamented with *4 or 5 wide, somewhat interrupted, red bands.* Spire turrited, the apex acute; whorls 7, rather flat, the last about three-sevenths the total length, a trifle compressed around the funnel shaped umbilicus. Columella subplicate; aperture vertical, oblong; peristome simple, the right margin narrowly expanded, columellar margin very broad, flattened. Alt. 32, diam. 12 mill.; alt. of aperture 13, width inside 7 mill. (*Pfr.*).

Andes of Bolivia (Reeve).

Bulimus bolivianus Reeve, Conch. Icon., pl. 44, f. 281 (not of Pfr.).—*B. annulatus* Rve., *t. c.* under sp. 599 (Dec., 1849).—Pfr., Monogr., iii, p. 346.

First described by Reeve as Pfeiffer's *bolivianus*. Pfeiffer considers *B. cerussatus* Reeve a variety of *annulatus*, but, if so, it will take priority over the latter.

Group of D. depictus.

Rather a heterogeneous assemblage of Colombian and Venezuelan species having the lip thin, unexpanded or but slightly so, and usually maculated or streaked.

D. semimaculatus Pilsbry, n. n. Vol. XII, Pl. 5, figs. 8, 9.

Shell narrowly umbilicate, ovate-pyramidal, slender, thin; white, slightly translucent, above the periphery having three faint or hardly visible brownish spiral bands marked at irregular intervals with squarish brown spots, which are arranged in vertical rows, and below the periphery with a subcontinuous brown band on the base, and another, often obsolete, around the umbilicus. Shining, smooth to the eye, but under a lens slight growth-wrinkles are seen, and a fine sculpture of clear-cut, incised spirals, rather close but irregularly spaced. Whorls 6½, nepionic 1¾ minutely grated, the rest but slightly convex.

Aperture ovate, somewhat oblique, less than half the shell's length; peristome thin, with almost imperceptibly everted edge in completely adult examples; columellar margin broadly and flatly dilated and reflexed above; columella nearly straight.

Alt. 22·2, diam. 10·5; alt. of aperture 9·6 mill. (type).

Alt. 19·5, diam. 9·8; alt. of aperture 8·3 mill.

Carthagena, Colombia (Gibbon); *Tributaries of the upper Amazons* (Bartlett); *Chiriqui, southern Panama; Costa Rica* (Gabb); *San Nicolas, central Nicaragua* (Tate); *coast near Champerico, western Guatemala* (Stoll); *Dolores and San Luis, district of Peten, northern Guatemala* (Morelet).

Bulimus maculatus Lea, Trans. Amer. Philos. Soc., vi, 1839, p. 86, pl. 23, f. 112; Obs. Genus Unio, etc., ii, p. 86, pl. 23, f. 112.—Pfr., Monogr. Helic. Vivent., ii, p. 205.—Reeve, Conch. Icon., v, *Bulimus*, pl. 48, fig. 309.—Tate, Am. Journ. Conch., 1870, p. 156.—Angas, P. Z. S., 1879, p. 479 [not *B. maculatus*, Bruguiere (1792), which=*Glandina dominicensis* Gmel.].—*Bulimus* (*Lepto-*

merus) *maculatus* PFR., in Malak. Blätt., ii, p. 160 (1855).—*Orthalicus* (*Leptomerus*) *maculatus* H. & A. ADAMS, Gen. Rec. Moll., ii, p. 156.—*Bulimulus* (*Liostracus*) *maculatus* VON MART., in Albers Die Helic.,ed.2, p.213.—FISCH. & CROSSE, Miss. Scient. Mex., Mollusca, i, p. 505.—*Otostomus* (*Liostracus*) *maculatus* H. ADAMS, P. Z. S., 1866, p. 443.—*O. maculatus* MARTENS, Biologia Centr. Amer., p. 220, pl. 14, f. 3.

Considerably resembling *D. dormani* Binn.,this species is decidedly narrower, with shorter aperture in proportion to the total length of the shell. *D. dominicus* has not the well developed, free columellar lip of *semimaculatus*, and the inner edge of the columella is much more delicate, thin and concave.

Fig. 9 is drawn from the type specimen, now in the U. S. National Museum (no. 105,153) from which the description also is taken. The Nicaragua specimens agree exactly with the Carthagena types. The name is changed on account of the earlier *Bulimus maculatus* of Bruguiere, Encycl. Méth., p. 365.

D. SEMIFASCIATUS (Mousson). Vol. XII, Pl. 5, figs. 6, 7.

Shell subperforate, oblong-conic, striatulate, not decussated, polished; white, brown spotted in series. Spire regular, acute; apex minute, flesh colored; suture slightly impressed, simple. Whorls 7, slowly increasing, a little convex, the last two-fifths the total altitude, not descending, oblong, rotund at base, with two series of spots above, and three brown, yellow-edged bands below. Aperture vertical, oval, showing the bands distinctly through; peristome unexpanded, acute, the terminations joined by a scarcely visible lamina; right margin gently incurved, columellar margin vertical, nearly straight, shortly reflexed, vaulted and appressed above. Alt. 27, diam. 12½ mill. (*Mouss.*).

Colombia (Wallis).

Bulimus semifasciatus MOUSS., Mal. Blätt., xvi, p. 175 (1869).—PFR., Novit. Conch., p. 129, pl. 129, f. 5, 6; Monogr., viii, 151.

Nearest, Mousson writes, to *B. maculatus*, but with more numerous, closer whorls, the spire a broader and wider cone, the surface smoother, only finely striated, without trace of spiral lines, and a color pattern of three entire, brown bands, yellow-edged on the base, the lowest one wider.

D. DEPICTUS (Reeve). Pl. 45, figs. 17–22.

Shell perforate, oblong, with long tapering spire, *solid and strong. Whitish or pale yellow, with numerous longitudinal reddish or purplish-brown streaks, interrupted by three (or four) sharply defined white girdles,* the upper one narrowest, nearer to the suture than to the subperipheral girdle, sometimes with another girdle interposed between these two; the basal girdle entering the aperture, dark band below it nearly continuous, defining a small white area around the perforation. Surface nearly lusterless, with slight irregular growth wrinkles. Whorls 6½, but slightly convex.

Aperture somewhat less than half the total altitude, irregularly ovate, showing the external coloring within; peristome unexpanded; columella straight, vertical, abruptly reflexed at the insertion.

Alt. 30½, diam. 13; alt. of aperture 14 mill.

Alt. 28, diam. 13⅓; alt. of aperture 13 mill.

New Granada (Reeve); *Caracas* (Ernst); *and Jali, prov. Merida, Venezuela* (Engel).

Bulimus depictus REEVE, Conch. Icon., pl. 74, f. 529 (Aug., 1849).—PFR., Monogr., iii, p. 337; iv, 397; vi, 44; viii, 56.—*Otostomus depictus* MARTENS, Binnenmoll. Venez., p. 183, pl. 1, f. 15–19; var. *ictericus*, pl. 1, f. 16, 17.—? *Bulimus pervariabilis* PFR., P. Z. S., 1852, p. 59; Monogr., iii, p. 337.

The above description applies to the typical form of this species. The specimens collected by Ernst have the aperture larger, at least half the shell's length, often more, and the pattern is various, sometimes broken by more light girdles, so that in some the coloring would be described as rows of spots, only the lowest interruption appearing as a sharply defined yellow band. In specimens from Caracas the streaks are sometimes so wide that they begin to coalesce; and in some specimens they are not interrupted.

Var. ICTERICUS Martens. Pl. 45, figs. 23, 24.

Sixty specimens were sent by Mr. Ernst from Caracas, which Von Martens states, leave him in doubt whether or not they are a variation of the preceding. The form is substantially identical, length of aperture varying between three-sevenths and one-half the total length; sculpture as in *depictus*. White, with more or less yellow suffusion below, the apex sulphur-yellow; interior of the aperture including parietal wall, almost always decided sulphur-yellow.

Var.? PERVARIABILIS Pfr.

Shell umbilicate, ovate-conic, rather thin, very delicately decussated; buff-whitish, generally with 5 subinterrupted bands. Spire conic, acute; whorls 6½, scarcely convex, the last a little longer than the spire, subinflated at base; columella lightly arcuate. Aperture slightly oblique, oval-oblong; peristome simple, white or yellowish, expanded, the columellar margin overhanging, dilated. Alt. 33, diam. 14½, alt. of aperture 17½ mill. (*Pfr.*).

Colombia.

A var. *β*, " more slender, reddish, somewhat streaked with brown, similar to *B. roseatus* Reeve, but widely umbilicate " is noted by Pfeiffer.

This is considered a synonym of *D. depictus* by von Martens. The single specimen before me differs from the *depictus* seen in being thinner, the spire shorter, the fine spiral striation distinct throughout.

D. GRANADENSIS (Pfeiffer). Pl. 45, figs. 36, 37.

Shell narrowly perforate, fusiform-ovate, thin, irregularly striated; whitish, with yolk-colored streaks and longitudinal blackish spots arranged in bands. Spire conic, rather acute. Whorls 6, a trifle convex, the last as long as the spire. Columella straight; aperture oval-oblong, colored within like the outside; peristome acute, simple, a trifle expanded, the columellar margin angularly reflexed in a thin triangular lamina, nearly closing the perforation. Alt. 26, diam.11, alt. of aperture 14 mill. (*Pfr.*).

Province of Merida, New Granada (Funck)

Bulimus granadensis PFR., P. Z. S., 1847, p. 231; Monogr., ii, p. 197; vi, p. 124.—PHILIPPI, Abbild. u. Beschreib., iii, p. 38, *Bul.*, pl. 8, f. 8.—REEVE, Conch. Icon., pl. 39, f. 234.

Von Martens has suggested the identity of this with *D. depictus.* It is likely that the latter is merely a form of *granadensis* with longer spire.

D. INCARNATUS (Pfeiffer).

Shell compressed-umbilicate, oblong-conic, thin, rather smooth; roseate flesh color, irregularly variegated with red streaks. Spire long-conic, rather acute; suture slight, pale; whorls 7, rather flat, the last a little shorter than the spire, somewhat compressed basally; columella compressed, rather straightly receding. Aperture scarcely

oblique, oblong-oval; peristome thin, the right margin narrowly expanded, columellar margin broadly reflexed. Alt. 31, diam. 12, alt. of aperture 15, width inside 8 mill. (*Pfr.*).

Venezuela (Cuming coll.).

Bulimus incarnatus PFR., P. Z. S., 1855, p. 95; Monogr., iv, p. 402.—*Otostomus incarnatus* MARTENS, Binnenmoll. Venezuela's, p. 31 (1873).

Said to be similar to *B. roseatus* Reeve, and not unlike *B. pervariabilis* var. β Pfr. It has not been figured.

D. LIVIDUS (Reeve). Pl. 45, fig. 31.

Shell subperforate, acuminate-oblong, thin, minutely decussately striated; tawny-gray, painted with squarish livid-violaceous spots arranged somewhat biserially. Spire long-conic, rather acute. Whorls 6 to 7, a little convex, the last shorter than the spire, ventricose. Columella somewhat straightened; aperture little oblique, oblong-oval; peristome simple, unexpanded, the columellar margin thin, dilated and reflexed above. Alt. 25, diam. 11 mill.; alt. of aperture 12, width 6 mill. (*Pfr.*).

Venezuela (Cuming coll.).

Bulimus lividus REEVE, Conch. Icon., pl. 85, f. 626 (1850).—PFR., Monogr., iii, p. 412.

D. PERTRISTIS Pilsbry, n. n.

Shell compressed-umbilicate, oblong-conic, thin, smooth, a little shining; whitish, ornamented with bands and streaks or series of square spots of violaceous-brown; spire convexly conic, the apex acute. Whorls 6½, a trifle convex, the last a little shorter than the spire, narrowed and rotund at base; columella lightly arcuate. Aperture slightly oblique, oval; peristome thin, the right margin narrowly expanded, columellar margin buff or white, dilated above, reflexed and overhanging. Alt. 28, diam. 11; alt. of aperture 14, width 7 mill. (*Pfr.*).

New Granada (Pfr. coll.).

Bulimus tristis PFR., P. Z. S., 1854, p. 124; Monogr., iv, p. 403. Not *Bulimus tristis* Jay, Catal., edit. 3, p. 121 (1839).

Allied, according to Pfeiffer, to *D. depictus* Reeve.

D. ROSEATUS (Reeve). Pl. 45, figs. 34, 35.

Shell subperforate, subfusiform-oblong, rather thin, rugose striatulate, marked with minute spiral lines, little shining; rose-whitish,

ornamented with irregular brownish streaks not extending below the middle of the last whorl; spire convex-conic, acute. Whorls 6, scarcely convex, the last slightly longer than the spire, attenuated at base; columella thread-like, receding. Aperture little oblique, oblong-oval; peristome simple, the right margin lightly arcuate, a little expanded, columellar margin dilated above, subappressed. Alt. 33, diam. 12 mill.; aperture 17 mill. long. (*Pfr.*).

Venezuela (Rve.); *New Granada* (Müller); *Amazonas* (Mouss.).

Bulimus roseatus Reeve, Conch. Icon., pl. 54, f. 353 (Dec., 1848).—Pfr., Conchyl. Cab., p. 246, pl. 66, f. 3, 4; Monogr., iii, p. 336; viii, p. 61.—Mousson, Malak. Bl., xvi, 1869, p. 76.—*Otostomus roseatus* Martens, Die Binnenmoll. Venez., p. 186·—? *Liostracus roseatus* Jousseaume, Mém. Soc. Zool. France, ii, 1889, p. 242 (Tovar, Venezuela).

Similar in coloring to *D. oreades* Orb.

D. lacteus (Lea). Pl. 45, figs. 38, 39.

Shell oblong-turrited, minutely rimate, thin; *milky white, with a single brown band encircling the umbilical chink, and usually some irregular bluish or reddish blotch-like longitudinal streaks (overlaid with white)*, subvertical, or somewhat oblique in a direction opposed to that of the growth striæ, and *not extending below the periphery on the last whorl; the base more translucent.* Surface glossy, with faint growth-lines and close, fine, superficial incised spiral lines throughout. Spire long, conic, the apex rather obtuse; whorls 7, slightly convex, the earlier $1\frac{3}{8}$ with typical *Drymæus* sculpture, last whorl rounded or faintly angular at the periphery.

Aperture oblique, ovate, white inside, and showing the external markings, *its length contained more than $2\frac{1}{2}$ times in that of the shell;* peristome thin, its edge the merest trifle expanded; columella vertical, with a convex fold above, the margin triangularly dilated and reflexed above.

Alt. 27, diam. 11·7; length of aperture 10·3 mill.

Alt. $27\frac{1}{2}$, diam 12; length of aperture 11 mill.

Colombia, about 100 miles up the Magdalena River (T. R. Peale).

Bulimus lacteus Lea, Trans. Amer. Philos. Soc., vi, p. 65, pl. 23, f. 100; Obs. Gen. Unio, ii, p. 65, pl. 23, f. 100·—Pfr., Monogr., ii, p. 169.

Lea's type was immature. The peculiar streaks described above are sometimes so faint that in the absence of more boldly marked

individuals they would be overlooked. *D. oreades* Orb. has a somewhat similar but more developed color-pattern. In *D. feriatus* Reeve, there is a similar basal band, but the aperture is much larger. *D. roseatus* also has a longer last whorl and aperture.

The type of *B. lacteus* has been lost from the Lea collection.

D. MERIDANUS (Pfeiffer). Pl. 45, fig. 26.

Shell perforate, oblong-subfusiform, striatulate, smooth; buff-whitish, ornamented with narrow blue-brown or wide chestnut bands interrupted by streaks; spire turrited-conic, rather acute. Whorls 6, a little flattened, the last as long as the spire. Columella lightly arcuate; aperture oblong-oval, colored within like the outside; peristome simple, the right margin narrowly expanded, columellar margin dilated, overhanging, reflexed, white; nearly closing the perforation. Alt. 29, diam. 11; alt. of aperture 15 mill. (*Pfr.*).

Merida, Venezuela (Mus. Cuming).

Bulimus meridanus PFR., P. Z. S., 1846, p. 33; Monogr., ii, p. 103.—REEVE, Conch. Icon., pl. 57, f. 386.

Pfeiffer assigned this species to "Merida, Bolivian Andes;" Reeve to Merida, New Granada, now in Venezuela. Von Martens unites *B. primula* Rve. as a synonym, but not from having seen specimens, apparently. Pfeiffer observes in the Monographia "compare *B. amœnus* Pfr."

D. DESHAYESI (Pfeiffer). Pl. 45, fig. 27.

Shell umbilicate, turrited, solid, striatulate; violaceous-white, irregularly marked with streaks and spots of purple-brown. Suture somewhat crenulate; whorls 9, a trifle convex, the last nearly one-third the total alt. Columella nearly straight, aperture oval, violaceous within; peristome simple, unexpanded, the columellar margin dilated, reflexed, overhanging, not closing the umbilical crevice. Alt. 45, diam. 15, alt. of aperture 16 mill.

Venezuela (Dyson).

Bulimus deshayesi PFR., P. Z. S., 1845, p. 73; Monogr., ii, p. 200; vi, 128.—REEVE, Conch. Icon., pl. 40, f. 250.

D. DUBIUS (Pfeiffer).

Shell subperforate, oblong-fusiform, thin, striated, a little shining; whitish-buff, ornamented with spadiceous, somewhat undulating streaks; spire slender, long-conic, the apex rather obtuse, suture submarginate. Whorls 6, slightly convex, the last a little shorter

than the spire, tapering at base, subcompressed. Columella subvertical, elongated nearly to the base of the aperture. Aperture slightly oblique, oblong, narrowed at each end, colored within like the outside; peristome simple, unexpanded, the right margin very lightly arcuate, columellar margin narrowly reflexed, overhanging, subappressed. Alt. 28, diam. 10; alt. of aperture 13, width in the middle 5½ mill. (*Pfr.*).

Andes of New Granada (Cuming coll.).

Bulimus dubius PFR., P. Z. S., 1851, p. 257; Monographia, iii, p. 413.

D. EFFEMINATUS (Reeve). Pl. 45, fig. 25.

Shell perforate, oblong-conic, rather solid, striated, somewhat shining; fleshy or bluish white, irregularly painted with brown streaks. Spire conic, rather acute, sometimes purplish above. Whorls 8, rather flat, the last shorter than the spire, rotund at base; columella scarcely arcuate. Aperture oblique, oblong oval; peristome simple, unexpanded, the right margin lightly arcuate, columellar margin dilated above, overhanging, reflexed. Alt. 31, diam. 13 mill.; aperture 15 mill. long. (*Pfr.*).

Colombia (Pfr.).

Bulimus effeminatus RVE., Conch. Icon., pl. 51, f. 338 (Nov., 1848).—PFR., Monogr., iii, p. 426; vi, p. 133; viii, p. 170.

D. MANUPICTUS (Reeve). Pl. 45, fig. 29.

Shell openly perforate, oblong-subfusiform, rather solid, striate; whitish, irregularly painted with brown and red streaks. Spire lengthened-conic, rather acute. Whorls 7, a trifle convex, the last about as long as the spire, somewhat tapering at base. Columella rather straightened, vertical. Aperture nearly vertical, oblong; peristome simple, unexpanded, the right margin lightly arcuate, columellar margin reflexed and overhanging above. Alt. 33, diam. 12½, alt. of aperture 17 mill. (*Pfr.*).

Andes of Colombia (Cuming coll.).

Bulimus manupictus REEVE, Conch. Icon., pl. 55, f. 369 (Dec., 1848).—PFR., Monogr., iii, p. 417.

D. FRESNOENSIS Pilsbry, n. sp. Pl. 40, fig. 18.

Shell oblong-turrited, perforate, moderately solid; pale yellowish-brown fading to whitish at suture and base, with numerous irregular,

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rather broad purple-brown streaks with ill-defined edges. Surface glossy with slight growth-wrinkles but no spiral striæ. Spire long, conic, the apex obtuse. Whorls 6½, *very convex*, the last tapering below.

Aperture slightly oblique, purple within, oblong, its length contained 2⅓ times in that of the shell; peristome whitish, not expanded; outer lip strongly arcuate above, less so below; columella vertical, nearly straight, with a slight gutter at its base, the columellar edge reflexed, face of the reflexed portion with an obliquely longitudinal convexity. Alt. 33, diam. 14½; alt. of aperture 14 mill.

Near Fresno, Colombia (T. Bland).

Resembles *D. manupictus* somewhat in general form, vertical columella and coloring, but the whorls are much more convex, the aperture smaller, and the form of the columellar expansion apparently different.

D. VIRGO (Lea). Pl. 45, figs. 40, 41.

Shell oblong-turrited, thin but moderately solid, perforate. White, either uniform or with small inconspicuous brown spots arranged in oblique series at irregular intervals, and sometimes a small purple-brown umbilical patch or band. Surface rather glossy, with slight wrinkles of growth. Spire very long, a little cylindric, with slightly convex lateral outlines. Whorls 7½, but slightly convex, the suture superficial; apex whitish-corneous or purple-black, 1⅔ earlier whorls sculptured as usual in *Drymæus;* last whorl quite convex below.

Aperture slightly oblique, small, *its length contained nearly three times in that of the shell,* white within; outer lip thin, acute, and not expanded; columella subvertical, nearly straight or markedly sinuous, the columellar margin abruptly dilated above, reflexed, adnate except for a small umbilical chink.

Alt. 26, diam. 9½; alt. of aperture 9 mill.

Alt. 23⅔, diam. 8⅔; alt. of aperture 8⅔ mill.

Near Carthagena (J. H. Gibbon), *and Mendez* (Bland), *Colombia.*

Bulimus virgo LEA, Trans. Amer. Philos. Soc., vi, p. 84, pl. 23, fig. 97 (June, 1838); Obs. Genus Unio, etc., ii, p. 84, pl. 23, f. 97. —*Bulimus gruneri* PFR., P. Z. S., 1846, p. 30; Monogr., ii, p. 213; vi, p. 132; Conchyl. Cab., p. 227, pl. 62, f. 11, 12.—REEVE, Conch. Icon., pl. 51, f. 332 (bad).—*Bulimulus gruneri* CROSSE & FISCHER,

Miss. Scient. Mex., Moll., i, p. 547.—Strebel, Beitr. Mex. Land- und Süsswasser-Conch., v, p. 92, pl. 6, f. 1 (and probably 1a, b), not "Form B," pl. 6, f. 2.—Martens, Biol. Centr. Amer., Moll., p. 245.

D. virgo Lea (*gruneri* Pfr.) is peculiar in the very long and rather stout, slightly cylindric spire, the superficial sutures, and the small aperture. The columella is decidedly pressed in at its insertion, almost guttered; and the coloring varies from pure white to a much interrupted, subobsolete pattern of brown dots arranged in three spiral series.

Lea's type specimen of *B. virgo* (pl. 45, fig. 41 from no. 105,076, U. S. Nat. Mus.) agrees in all respects with immaculate specimens of *B. gruneri*. The columella is straight and vertical, only weakly twisted above.

The Mexican habitat assigned *B. gruneri* by Pfeiffer is doubtless an error. Whether the shells from Soganovo, Ecuador, figured under this name by Strebel are the true *gruneri* or not I would not attempt to decide without seeing them, but they certainly look like it. The specimens before me were collected by Bland himself at "Mendez, N. G." where both spotted and immaculate shells occurred.

D. demerarensis (Pfeiffer).

Shell perforate, ovate-turrited, rather solid, striatulate, and under the lens indistinctly somewhat decussated; opaque; whitish, irregularly marked with brown streaks. Spire lengthened conic, rather acute. Whorls 6, little convex, the last more than one-third the length of the shell, subangulate, the angle disappearing on the latter part. Aperture oblique, truncate-oval; peristome narrowly expanded, the columellar margin arcuate, reflexed and overhanging above. Alt. 20½, diam. 10; alt. of aperture 9½, width 5⅜ mill. (*Pfr.*).

Demerara (Cuming coll.).

Bulimus demerarensis Pfr., P. Z. S., 1861, p. 24; Malak. Bl. 1861, p. 14; Monogr., vi, p. 51.

D. demotus (Reeve). Pl. 43, fig. 81.

Shell perforate, ovate-conic, rather thin, smooth, showing concentric striæ under the lens, shining; white, ornamented above with rows of light red spots; spire conic, slightly acute. Whorls 6, a

little flattened, the last a little shorter than the spire, rounded at base, where it is belted with light red. Columella nearly straight, somewhat receding; aperture little oblique, oval; peristome simple, the right margin narrowly expanded, columellar margin dilated above, reflexed, flat, subappressed. Alt. 32, diam. 13 mill.; aperture 16 mill. long, 9 wide in the middle. (*Pfr.*).

Venezuela.

Bulimus feriatus REEVE, Conch. Icon., pl. 54, f. 354 (preoc.).—*Bulimus demotus* REEVE, in errata, p. xi (1850.—PFR., Monogr., iii, p. 340.—*Otostomus demotus* MARTENS, Binnenmoll. Venez., p. 31.

Spotted somewhat as in *maculatus*, but more solid, with a conspicuous dark band around the perforation.

D. NIGROFASCIATUS (Pfeiffer). Pl. 50, figs. 98, 99 (typical), and f. 96, 97, 100 (var.).

Shell perforate, ovate, thin, rather smooth; whitish-yellow, ornamented with *five wide black bands*. Spire conic, the apex acute. Whorls 6, slightly convex, the last more swollen, as long as the spire. Columella straight, vertical. Aperture semioval, colored within like the outside; peristome simple, unexpanded, the right margin arcuate, columellar margin dilated down to the base, narrowly reflexed. (*Pfr.*). Alt. 24, diam. 14 mill.; aperture 12½ mill. long, 7½ wide in the middle.

Magdalena Valley, Colombia (Cuming and Gruner collections).

Bulimus nigrofasciatus PFR. in Philippi, Abbild. u. Beschreib. neuer oder wenig gekannter Conch., ii, p. 125, Bulimus, pl. 5, f. 7 (October, 1846); Monogr., ii, p. 194; iii, 416.—REEVE, Conch. Icon., pl. 55, f. 379 (1848).—DESH. in Fér., Hist., p. 81, pl. 145, f. 22–24.—*Bulimulus nigrofasciatus* STREBEL, Beitr. Mex. Land- und Süssw.-conch., v, p. 90, pl. 12, f. 11a, b (shell); pl. 13, f. 17a, b; pl. 15, f. 5a, b (anatomy).

In addition to Pfeiffer's diagnosis, given above, it may be added that the apical sculpture is typical, and slight traces of spiral striæ appear in places on some specimens. The band at the suture is narrow, the fourth band and umbilical patch wide.

Var. *elongatulus* n. v. Pl. 50, fig. 100.

More lengthened and slender, the aperture less than half the total length of shell; white, with five black-brown bands, as in the type.

Bands ii and iii occasionally have somewhat crenate or ragged edges.

Strebel has figured (pl. 50, figs. 96, 97) slender specimens from Tequendano, Ecuador (Dr. Reiss), and he also reports the species from Tacatativa, on the Bogota plateau (v. Nolcke). The specimens from Tequendano, show variation in the bands, in some examples bands 1 and 3, or only 1, or 1, 2, 3, 4 being obsolete. They apparently belong to the slender variety *elongatulus*.

D. AMOENUS (Pfeiffer).

Shell subperforate, fusiform-oblong, longitudinally striated, opaque; yellowish, clouded with roseate, with 4 red bands and a fifth basal roseate band. Spire turrited-conic, the apex rather acute; whorls 6, a little flattened, the last equal to the spire. Columella compressed above, then lightly arcuate. Aperture oval-oblong, colored within like the outside; peristome simple, straight, right margin somewhat spreading, columellar margin narrowly reflexed, subadnate. Alt. 29, diam. 10 mill.; aperture 15 mill. long, 7 wide in the middle. (*Pfr.*).

Habitat unknown (Philippi coll.).

Bulimus amœnus PFR., Zeitschr. f. Malak., 1847, p. 82; Monogr. ii, p. 172.

D. FIDUSTUS (Reeve). Pl. 50, fig. 95.

Shell subperforate, oblong-conic, thin, striatulate, shining; corneous-buff, ornamented with three wide chestnut bands, the upper one interrupted. Spire long, rather obtuse. Whorls 6½, a little convex, the last more convex, a little shorter than the spire, rotund at base. Columella somewhat straightened. Aperture oblique, truncate-oval; peristome simple, unexpanded, the right margin lightly arcuate, columella margin dilated above, narrowly rolled backward, subappressed. Alt. 23, diam. 11, length of aperture 11, width 6 mill. (*Pfr.*).

Sebundoi, Colombia (Funck in Cuming coll).

Bulimus fidustus REEVE, Conch. Icon., pl. 76, f. 557 (Aug., 1849). —PFR., Monogr., iii, p. 413; vi, p. 115.

The species reported by von Martens as *Bulimulus fidustus* in Jahrb. d. D. Mal. Ges., iii, 1876, p. 258, was probably different.

D. RUFOLINEATUS (Drouet). Vol. XII, pl. 12, figs. 12, 13.

Shell subperforate, oblong-acuminate, thin, *fragile, more or less translucent*, rather smooth, shining; *white with 3 rufous interrupted bands* and sometimes a fourth around the perforation. Whorls 6,

slightly convex; peristome simple, acute; columellar margin reflexed. Alt. 18–20, diam. 10, length of aperture 9 mill. (*Dr.*).

Ilet-la-Mère, French Guiana, on tree trunks (Eyries).

Bulimus rufolineatus DROUET, Essai sur les Moll. terrestr. et fluv. de la Guyane Française, p. 61, pl. 1, f. 10, 11 (1859).—PFR., Monogr., vi, p. 116.

Differs from *D. imperfectus* of Trinidad in having three or four instead of five bands. It is allied to Antillean rather than to continental species.

Group of D. virginalis.

Rather thin, yellow or white one-colored shells with acute peristome. The following Colombian and Venezuelan species are closely allied to *D. litiaceus* and its allies of the Antilles, and *D. sulphureus* and related forms of the middle American mainland, all being doubtless of common origin. They are also closely allied to the preceding group.

D. VIRGINALIS (Pfeiffer). Pl. 26, figs. 83, 84, 87.

Shell perforate, oblong-turrited, thin, nearly smooth (very finely decussated, under the lens), subpellucid, whitish; spire long-conic, the apex buff, acute; whorls 7, but a trifle convex, the last about three-sevenths the total length, subcompressed at base. Columella lightly arcuate. Aperture slightly oblique, oblong; peristome simple, thin, the right margin slightly arcuate, narrowly expanded, columellar margin dilated and reflexed. (*Pfr.*).

Alt. 26, diam. 12, length of aperture 12⅓ mill.

Alt. 29, diam. 13, length of aperture 13½ mill.

Alt. 27, diam. 12, length of aperture 12 mill.

Caracas, Venezuela (Klocke, Lansberg, and others), *and near the mouth of the river Yaraqui* (Hellyer, in Swift coll.).

Bulimus virginalis PFR., Malak. Bl., iii, p. 46 (1856); Monogr., iv, p. 405; Novit. Conch., iii, p. 422, pl. 96, f. 1, 2.—*Otostomus (Mormus) virginalis* MARTENS, Binnenmoll. Venez., in Festschr. zur Feier 100-jahrigen Bestehens der Ges. naturforsch. Freunde zu Berlin, p. 184, pl. 1, f. 5; also pl. 2, f. 21a-f, teeth and jaw, by Schako.—*Bulimulus virginalis* STREBEL, Beitr. Mex. Land- und Süsswasser-Conch., v, p. 88, pl. 12, f. 14 (shell), pl. 15, f. 4a-d (anatomy).

Considerably like *D. liliaceus* in general appearance. It is thin, white or of a very pale yellow tint, often with bluish streaks; the

spire is straightly conic, aperture always decidedly less than half the length of the shell, and the lip either very slightly expanded or not perceptibly so. *D. sulphureus* Pfr. from Mexico has a larger aperture, but is closely allied to *virginalis*. The Mexican localities given by some authors for *virginalis* are probably based upon the closely allied *D. sulphureus*, as von Martens believes.

D. virginalis has also been reported from Dominica by A. D. Brown. See under Antillean species.

D. ELECTRUM (Reeve). Pl. 41, fig. 36.

Shell perforate, ovate-oblong, thin, striatulate, seen under the lens to be sculptured with close spiral lines; diaphanous, pale buff. Spire convex-conic, the apex subacute. Whorls 5½, rather flat, the last a little longer than the spire, rotund at base. Columella thin, lightly arcuate. Aperture oblique, oblong-oval; peristome simple, the right margin narrowly expanded, columellar margin dilated above, reflexed, flat, subappressed. Alt. 30, diam. 12 mill.; apert. 16 mill. long, 9 wide. (*Pfr.*).

Venezuela (Cuming coll.).

Bulimus electrum REEVE, Conch. Icon., pl. 56, f. 373 (Dec., 1848). —PFR., Monogr., iii, p. 337.

"A delicate, transparent shell of somewhat glassy texture, distinguished by its bright amber color."

D. TENUILABRIS (Pfeiffer).

Shell profoundly umbilicate, ovate-turrited, thin, smoothish (under the lens minutely spirally striated), shining; alabastrine; spire turrited, the apex acute; whorls 7, rather flattened, the last shorter than the spire, slightly ascending in front, compressed-rotund at base. Aperture slightly oblique, truncate-oblong; peristome simple, the right margin narrowly expanded, columellar margin much dilated as far as the base. Alt. 30, diam. 12 mill.; aperture with peristome 14½ mill. long, 10 wide. (*Pfr.*).

Venezuela (Cuming coll.); *Lower Magdalena* (Mouss.).

Bulimus tenuilabris PFR., P. Z. S., 1865, p. 831; Monogr., vi, p. 50.—MOUSS., Malak. Bl., xvi, 1869, p. 177.

D. FLAVIDUS (Menke). Pl. 26, figs. 71, 72, 73.

Shell ovate-acute, subperforate, thin, yellow, the suture white margined. Length 10 lines. Var. *a*, yellow throughout. Var. *b*, reddish below (*Mke.*).

Caracas, Venezuela (Lansberg, Gollmer).

Bulimus flavidus MENKE, Verzeichn. d. Conchylien-Samml. des Freiherrn v. d. Malsburg, p. 6 (1829).—PFR., Monogr., viii, p. 166. —*Otostomus flavidus* MARTENS, Binnenmoll. Venez., p. 185 (29), pl. 1, f. 9.—*Helix liliacea* var. *flavescens* FER., Prodr., no. 401; Histoire, p. 42 B, f. 14.—*Bulimus liliaceus* REEVE, Conch. Icon., pl. 45, f. 287.—*Bulimulus flavidus* STREBEL, Beiträge Mex. Land- und Süssw.-Conch., v, p. 89, pl. 12, f. 15 (shell); pl. 15, f. 6 a-d, 10 (anatomy).

This species was formerly placed in the synonymy of *B. stramineus* by Pfeiffer, its validity being first demonstrated by Dr. von Martens in 1873. He writes: Very similar to the preceding [*virginalis*], but fuller and fatter in form, the color intense yellow, spiral striation the same; 23 mill. long, half that breadth; aperture somewhat less than half the total length, the peristome very weakly expanded. In the Berlin Museum there are specimens (No. 10,338) with the above name, from the Malsburg collection, which agree well with Férussac's fig. 14, some of them, especially, showing the characteristic rose-red color near the aperture.

D. DEBILIS ("Beck" Martens). Pl. 26, figs. 74, 75.

Very similar to the preceding [*D. flavidus*], but of fuller form, the color more yellowish, the peristome, it seems, quite unexpanded, the spiral striation the same. Length 23 mill., diam. and length of the aperture nearly or fully half the length of shell. The contour is much the same as in *B. detritus;* the color becomes a pronounced yellow on the lower half of the last whorl. One of the three examples show traces of spots on the upper whorls (*Martens*).

Caracas, Venezuela (Lansberg, in Berlin Mus.); *Antilles* (Beck).

Bulimulus debilis BECK, Index Moll., p. 65 (1837), based upon Férussac, Histoire, pl. 142 B, f. 10.—*Otostomus* (*Mormus*) *debilis* MARTENS, Binnenmoll. Venez., p. 186 (1873).—Not *Bulimus fragilis* Lam., DESHAYES in Fér. Hist., ii, p. 73.

This species was based by Beck on two figures of Férussac (reproduced on my plate), without a description. These figures have been considered to represent *D. stramineus* Guild., an interpretation favored by the locality given by Beck. Dr. von Martens, however, has identified as Beck's species certain shells from Caracas, Venezuela, his description of which is given above. While no certainty is, at present, attainable, I have accepted von Martens' identification as temporarily the best course.

D. COLUMBIANUS (Lea). Pl. 45, fig. 33.

Shell elongately turrited, perforate, shining, white; thin; transversely and minutely striate; apex golden color; whorls 7; aperture rather small; outer lip acute. Length 1·2, diam. 0·5 inch. (*Lea*).

About 100 miles up the Magdalena River, Colombia (T. R. Peale).

Bulimus columbianus LEA, Trans. Amer. Philos. Soc., vi, p. 66, pl. 23, f. 110 (1838); Obs. Genus Unio, etc., ii, p. 66, pl. 23, f. 110.

The spire is long, and the aperture about one-third the length of the shell. It is nearly milk-white, and so thin as to be somewhat translucent (*Lea*).

The type was in Peale's "Philadelphia Museum," and all trace of it was lost upon the breaking up of the Museum in 1844.

D. VENEZUELENSIS (Martens). Pl. 50, fig. 80.

Shell somewhat fusiformly oblong, thin, hyaline; compressly umbilicated. Whorls 7 in number, flatly convex, smooth, minutely striated beneath the lens; columella broadly reflected, depressed; aperture rather oblique; lip simple, a little effused. Transparent white (*Rve.*).

Caracas, Venezuela (Moritz).

Bulimus membranaceus Phil., REEVE, Conch. Icon., pl. 75, f. 544 (1849), not of Philippi.—*Otostomus* (*Mormus*) *membranaceus* MARTENS, Binnenmoll. Venez., p. 186, in Festschr. zur Feier des 100 Jährigen Bestehens der Ges. Naturforsch. Freunde zu Berlin (1873).—*Otostomus venzuelensis* MARTENS, Biol. Centrali-Americana, Moll. Terr., p. 224 (Sept., 1893), concealed in text relating to *Otostomus emeus.*

"Has the delicate, unicolored shell and fine, regular spiral striation in common with *virginalis* and *flavidus*, but is larger and fatter than either. Length 31, diam. four-ninths the length; length of aperture a very little more, but less than half. Larger and yellow colored, but quite similar in form is Reeve's *B. electrum*, also from Venezuela." (*Martens*, 1873).

"The shell figured by Reeve as *B. membranaceus* is not Philippi's type; it is probably similar to the Venezuelan specimens referred by me to *O. membranaceus* in the paper quoted above [Binnenmoll. Venezuela's], and which may now be separated as a distinct species under the name of *Otostomus venezuelensis.*" (*Martens*, 1893).

D. GRATUS (Pfeiffer).

Shell shortly rimate, subperforate, oblong-turrited, solid, nearly smooth, little shining, yellow-whitish; spire lengthened, somewhat convexly turrited, the apex corneus, rather acute. Whorls 7, slightly convex, the last forming three-sevenths the total length, somewhat compressed basally. Columella straightened, receding. Aperture a little oblique, oblong-oval; peristome unexpanded, acute, the right margin lightly arcuate, columellar margin abruptly reflexed, flat. Alt. 28, diam. 11½, alt. of aperture 13, width 6½ mill. (*Pfr.*).

Colombia (Cuming coll).

Bulimus columbiensis PFR., P. Z. S., 1854, p. 124 (not of Lea).—*Bulimus* (*Mesembrinus*) *gratus* PFR., Malak. Bl., 1855, p. 159.

D. AMANDUS (Pfeiffer). Pl. 26, fig. 76.

Shell narrowly perforate, oblong-conic, thin, nearly smooth (under the lens seem to be very finely spirally striated), diaphanous, very pale rose-colored. Spire long-conic, rather acute. Whorls 6, a little convex, the last a little shorter than the spire, obsoletely angled below the middle, slightly attenuated at base. Columella arcuate, compressed. Aperture oblique, angular-oval, the peristome simple, unexpanded, acute; columellar margin narrowly and abruptly reflexed. Alt. 30, diam. 11½; aperture, alt. 14, width 8 mill. (*Pfr.*).

Venezuela (Cuming coll.).

Bulimus amandus PFR., P. Z. S., 1855, p. 96, pl. 31, f. 4; Monogr., iv, p. 481.

Section *Stenostylus* Pilsbry, 1898.

Stenostylus PILS., this volume, p. 184 (May, 1898).

Shell similar in the thread-like columella to *Eudioptus*, but with wrinkled surface, opaque, variegated coloring, and the apical sculpture of *Drymæus*. Type *D. nigrolimbatus* Pfr.

Distribution, Andean region, Peru to Colombia.

The slender columella and system of coloring have caused systematists to group these species in *Plectostylus*, but they differ from that Chilian subgenus in having the apical sculpture of *Drymæus*. *Eudioptus* proves to belong in or near *Simpulopsis*, and is, therefore, not allied to these species.

Simpulopsis fulgurata of Miller has some resemblance to these forms, but may be a very young *Eurytus*.

D. KOCHI (Pfeiffer). Pl. 46, figs. 42, 43.

Shell imperforate, ovate, very thin, somewhat wrinkled; blackish-olivaceous, covered with a very thin, deciduous epidermis. Spire short, obtuse. Whorls 4, convex, the last one over two-thirds the length of the shell. Columella simple, thread-like, whitish, rather straight. Aperture oblong-oval, colored within like the outside; peristome simple, the right margin arching forward. Alt. 20½, diam. 12; alt. of aperture 15 mill. (*Pfr.*).

Amable Maria, Peru (Jelski).

Bulimus kochi PFR., Zeitschr. f. Malak., 1846, p. 114; Monogr., ii, p. 148; iii, p. 383; viii, p. 126.—PHILIPPI, Abbild. u. Beschreib., iii, p. 20, *Bul.*, pl. 8, f. 10.—*Bulimus* (*Plectostylus*) *kochi* LUBOMIRSKI, P. Z. S., 1879, p. 724.

D. GUTTULA (Pfeiffer). Pl. 46, figs. 61, 62.

Shell perforate, ovate-conic, very thin, striated, pellucid, corneous; spire conic, the apex obtuse. Whorls 5, a little convex, the last somewhat longer than the spire, rotund. Columella lightly arcuate. Aperture oblique, truncate-oval; peristome simple, thin, narrowly expanded, the columellar margin vaulted, a little reflexed, Alt. 16, diam. 9; length of aperture 8½ mill. (*Pfr.*).

Gualea, Ecuador (Bourcier).

Bulimus guttula PFR., P. Z. S., 1852, p. 154; Conchyl. Cab., p. 100, pl. 32, f. 7, 8; Monogr., iii, p. 339; vi, 45.—*Leptomerus guttula* MILLER, Mal. Bl., 1878, xxv, p. 194.

D. GOUDOTI (Petit). Pl. 46, figs. 44, 49.

Shell imperforate, ovate, thin, pellucid, brown-olive; whorls 5, slightly convex, longitudinally irregularly, delicately striated; the last whorl a little longer than the spire; columella angulose-callous in the middle. Aperture oblong-oval, dull bluish inside; peristome simple, the columellar margin a little reflexed. Alt. 39, diam. 19; aperture, alt. 23, width 14 mill. (*Pfr.*).

Mt. Tolima, Prov. Sta. Fe de Bogota, Colombia (Goudot).

Bulimus goudoti PETIT, Revue Zool., 1843, p. 239; Guerin's Mag. de Zool., 1843, pl. 67.—PFR., Monogr., ii, p. 167.—REEVE, Conch. Icon., pl. 37, f. 218.

D. TROSCHELI (Philippi). Pl. 46, figs. 45, 46.

Shell covered perforate, ovate, thin, somewhat wrinkled, buff-olivaceous. Spire pyramidal, the apex obtuse; whorls 5, rather

flat, the last nearly double the length of the spire; suture submarginate, crenulated. Aperture oblong-oval; columella simple, thread-like; peristome simple, unexpanded, the columellar margin appressed, dilated. Alt. 33, diam. 16½ mill. (*Phil.*).

"*Hacienda de Unigambal,*" *Peru* (Raimondi), 3,200 meters elevation.

Bulimus troscheli PHIL., Malak. Bl., xiv, 1867, p. 71.—PFR., Novit. Conch., p. 345, pl. 81, f. 13, 14; Monogr., vi, p. 89.

Seems to be nearly allied to *B. kochi* Pfr. Embryonic whorls very densely impressed-punctate; columellar margin dilated; last whorl obliquely descending near the suture (*Phil.*).

D. NIGROLIMBATUS (Pfeiffer). Pl. 46, figs. 47, 48.

Shell imperforate, ovate, thin, rugose, somewhat granulated by close spiral striæ, slightly shining; tawny olivaceous, variegated by narrow chestnut streaks. Spire conic, the apex obtuse. Whorls 5, a little convex, the last somewhat longer than the spire, more convex, the base rotund. Columella thin, somewhat calloused, rather receding. Aperture oblique, angular-oval, plicated and with a pearly luster inside; peristome simple, unexpanded, obtuse, margined with black. Alt. 28, diam. 14; alt. of aperture 15½ mill. (*Pfr.*)

Andes of New Granada (Cuming coll.).

Bulimus nigrolimbatus PFR., P. Z. S., 1851, p. 157; Monographia, iii, p. 382; Conchyl. Cab., p. 81, pl. 21, f. 26–30.

Pfeiffer describes and figures two varieties: *beta*, form nearly as in the type, color olivaceous with darker streaks, the spiral lines obsolete; alt. 29, diam. 14, alt. of aperture 16 mill. (fig. 56). Var. *gamma*, shell more ovate, colored like the type; alt. 25½, diam. 13½, length of aperture 15 mill. (figs. 50, 51).

D. MELEAGRIS (Pfeiffer). Pl. 46, figs. 52, 53.

Shell imperforate, acuminate-ovate, rather thin, granulated by close growth-striæ and spiral lines, little shining; tawny, streaked and irregularly blotched with brown. Spire conic, acute; suture somewhat crenulated. Whorls 5½, rather flattened, the last a little longer than the spire, more convex, descending in front, rotund at base. Columella thread-like, lightly arcuate. Aperture oblique,

oblong-oval, with a pearly luster within; peristome simple, unexpanded. Alt. 31, diam. 14; alt. of aperture 17½ mill. (*Pfr.*).

Andes of Colombia (Cuming coll.).

Bulimus meleagris Pfr., P. Z. S., 1851, p. 157; Conchyl. Cab., p. 81, pl. 21, f. 24, 25; Monogr., iii, p. 382.

D. filaris (Pfeiffer).

Shell imperforate, ovate-conic, thin, irregularly plicate-striate, diaphanous, *dull white, ornamented with wide, angular, blackish streaks*, on the last whorl forming obsolete bands. Spire conic, a little acute; suture crenulate; whorls 5½, a trifle convex, the last equal in length to the spire, dilated above and below. Columella strongly receding, thread-like. Aperture oblique, oval, with a somewhat pearly luster within; peristome simple, unexpanded, subeffuse at base. Alt. 26, diam. 12; aperture 14 mill. long, 8 wide below the middle (*Pfr.*).

Habitat unknown (Cuming coll.).

Bulimus filaris Pfr., P. Z. S., 1853, p. 50; Monogr., iii, p. 653.—*Orthalicus* (*Plectostylus*) *hilarus* H. & A. Ad., Gen. Rec. Moll. ii, p. 155.

An unfigured species of which the affinities are not known. Probably a *Plectostylus*, though it might belong to the section *Stenostylus*.

D. colmeiroi (Hidalgo). Pl. 46, figs. 54, 55.

Shell imperforate, Succinea-like, ovate-conic, very thin, somewhat shining; hyaline, closely and obliquely ornamented with irregular, obsolete, opaque-whitish wrinkles. Spire conoid, the apex a little obtuse, pale corneous; suture simple. Whorls 5, a little convex, increasing at a moderate rate, the first seen under the lens to be most minutely decussated, the last whorl somewhat descending in front, rotund at base. Columella hair-like, somewhat obliquely arcuate, its spiral trend visible (from below) as far as the apex.

Aperture oval, colored within like the outside, five-ninths the length of the shell; peristome simple, unexpanded, acute, the margins somewhat approximating, right margin regularly arcuate, columellar margin indistinct. Alt. 19, diam. 10 mill. (*Hid.*).

Baeza, Ecuador (Martinez).

Bulimus colmeiroi Hidalgo, Mol. Viaje al Pacifico, p. 122 (1869); Journ. de Conchyl., 1875, p. 129, pl. 7, f. 3.—Pfr., Monogr., viii, p. 125.

With the form of *D. nigrolimbatus*, this species is smaller, without the subgranulose spiral lines, and of a different color.

D. TAPADOIDES (Philippi). Pl. 46, figs. 59, 60.

Shell subimperforate, oblong, very thin, somewhat plicate; olive-green, the folds whitish. Whorls 4½, the last a little longer than the spire. Aperture semi-ovate; columella thread-like, receding; peristome unexpanded, very thin; columellar margin a little dilated above, very thin, almost completely closing the perforation. Alt. 18, diam. 10 mill.; alt. of aperture 10, width 5¼ mill. (*Phil.*).

Tarma, Peru (Isern).

Bulimus tapadoides PHIL., Malak. Bl., xiv, 1867, p. 71.—PFR., Novit. Conch., p. 338, pl. 80, f. 14, 15; Monogr., vi, p. 89.

Apparently allied to *D. colmeiroi* Hid.

D. IGNOBILIS (Philippi). Pl. 46, figs. 57, 58.

Shell imperforate, ovate-turrited, slightly striatulate; white, with some rufous-corneous blotches and streaks. Apex obtuse; whorls 6, rather flat, gradate, separated by a deep suture, the last whorl rounded, ventricose, about equalling four-ninths the total length. Aperture ovate-oblong, columella thread-like, twisted, receding; peristome unexpanded, acute, a thin callus joining the margins and covering the umbilical region. Alt. 25½, diam. 18 mill.; alt. of aperture 12½, width 6¼ mill. (*Phil.*).

Chanchamayo, Peru (Raimondi).

Bulimus ignobilis PHIL., Malak., Bl. xiv, 1867, p. 72; Novit. Conch., p. 340, pl. 80, f. 21, 22; Monographia, vi, p. 106.

The embryonal whorls are pale corneous, and under the lens are seen to be strongly, though finely, punctulate. The rest of the shell shows malleation in places.

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B. CORÆFORMIS Pils. (p. 15).

A better figure of the apical sculpture is given on pl. 26, fig. 85.

Subgenus PLECTOSTYLUS (p. 2).

B. PUNCTULIFER (Sowerby). Pl. 26, figs. 67–69; pl. 8, fig. 27.

Shell ovate-oblong, subacuminate, whitish, most minutely rugulose, covered with a very thin yellowish cuticle, sparsely ornamented

with blackish dots arranged in series. Whorls 5, a little ventricose; suture somewhat impressed. Aperture elliptical, acuminate above; peristome thin. Length 1·5, diam. 0·75 inch. (*G. B. Sowerby*).

Chili: Questa Prado, under stones (Cuming); *Questa de Arenas, Huasco* (Bridges).

Bulinus punctulifer SOWB., P. Z. S., 1833, p. 36; Conchol. Illustr., f. 36.—*Bulimus punctulifer* REEVE, Conch. Icon., pl. 16, f. 92.—GAY, Hist. de Chile, viii, p. 103.—PFR., Monogr., ii, p. 150; vi, p. 90.—*Helix punctulifer* GAY, Atlas of Hist. de Chile, pl. 2, f. 1.

I have not seen this species. Sowerby's figure is copied, pl. 8, fig. 27. Those of Reeve, pl. 26, figs. 67–69, are said by Mr. E. R. Sykes, who has examined the B. M. specimens (probably types) for me, to be better for contour. The apex, according to Mr. Sykes, is involute and wrinkled. This indicates that the species is a *Plectostylus*, though if so, the subperforate axis mentioned by Pfeiffer is an unusual feature. When preparing my account of this group I had decided to treat *punctulifer* as a *Drymœus*, confusing it with *D. acervatus*, a somewhat similarly marked but openly umbilicated species from southern Brazil.

Gay's figures of a specimen from the department of Huasco, look rather different from those of Sowerby and Reeve.

B. PROLATUS (Gould). Pl. 2, figs. 22, 23.

Shell an elongated, prolate spheroid, nearly as much attenuated at base as at spire, surface nearly smooth and regular, of a grayish or ash-color, with about four revolving bands of partially connected blotches on the large whorl, and three on the smaller ones. Whorls five slightly convex, and a very little rounded at the sutures. Aperture about half the length of the shell, of an elliptic form, a little angular posteriorly; lip simple, the columella rather broadly reflexed, short, white, and protecting a small umbilical perforation. (*Gld.*). Alt. 1·75, diam. 1 inch.

Near Santiago, Chili (Couthouy).

Bulimus prolatus GLD., Proc. Bost. Soc. N. H., ii, p. 191 (Dec., 1846); U. S. Exploring Expedition, Moll. and Shells, p. 74, pl. 6, figs. 79, 79a.—PFR., Monogr., ii, p. 171.

Evidently near *B. punctulifer*. "A shell remarkable for its regular, elongated ovoid form and its four bands of rusty-brown blotches."

Subgenus BULIMULUS *s. str.*

B. MENDOZANUS Strobel (p. 71).

The generic position of this species is not known, the apex still being unexamined.

Var. BONAERENSIS Doering.

Differs from var. *azulensis* (from the Sierra Baya) in having the spire lengthened, less ventricose, the suture deeper, aperture smaller, and the color olivaceous-green. (*Doering*).

Alt. 20, diam. 10; alt. of aperture 12, width 7 mill.

Alt. 22, diam. 11; alt. of aperture 12½, width 7 mill.

Alt. 25, diam. 12; alt. of aperture 13, width 8 mill.

Alt. 26, diam. 13; alt. of aperture 14, width 8 mill.

Alt. 30, diam. 15; alt. of aperture 15, width 10 mill.

Escalones de las Aguilas, Sierra del Tandil (Holmberg).

Eudioptus mendozanus Strob., var. *bonaërensis* DOER., Actes de la Academia Nacional de Ciencias en Cordoba, v, pt. 2, p. 111, pl. 2, f. 1 (1884).

Var. AZULENSIS Doering. Pl. 26, figs. 79, 80.

The color is dark amber-olivaceous, with longitudinal irregular streaks of a somewhat darker shade. The shell is very delicate and somewhat flexible, with many plicæ or strong wrinkles, and with a rather glossy surface. Inside it is smooth and somewhat nacreous. (*Doer.*).

Alt. 24, diam. 12; alt. of aperture 15, width 8 mill.

Alt. 25, diam. 14½; alt. of aperture 16, width 9 mill.

Alt. 27, diam. 14½; alt. of aperture 17, width 9 mill.

Alt. 28, diam. 15; alt. of aperture 16½, width 10½ mill.

Alt. 29, diam. 16; alt. of aperture 17, width 10 mill.

Sierra de Sotoya to the Sierra de Olavarria, Rio Negro region, Argentina.

Eudioptus mendozanus Strob. var., DOER., in Roca's Informe Oficial de la Comis. Cient. Exped. al Rio Negro, i, Zoologia, p. 62, pl. 1, f. 1, 1a (1881).—Probably *E. mendozanus* var. *azulensis* DOER., 1884, see below.

Jaw with 12 thick ribs, the terminal ones dilated, intermediates unequal and comparatively narrow, the central ribs a little narrower and conical. The species is allied, according to Doering to *D. tortoranus* (Vol. X, p. 192), *B. cordillerœ* Strob. (p. 191) and *B. mon-*

ticola Doer. (p. 191); and its analogue in the Cordillera is *B. nivalis* Orb. (this Vol., p. 72).

Doering gives no varietal name to this form in the "Informe Oficial," but it is apparently what he refers to as var. *azulensis* in the later publication quoted above. Whether the species is a *Lissoacme* or a typical *Bulimulus* I do not know.

B. AGUIRREI (Doering).

Shell rimate, ovate-conic, oblong, rather thin, shining; whitish-corneous, covered with a pellucid brown-corneous cuticle; striæ close, irregular, rugose, sometimes variegated with brownish; spire ovate-conic, the apex rather acute; whorls 5½, a little convex, the last whorl scarcely half the length; suture generally subcrenulate; aperture oblong-ovate; peristome simple, thin, acute; the right margin regularly arcuate, columellar margin narrowly reflexed. Alt. 24, diam. 12; alt. of aperture 13, width 7–8 mill. (*Doering*).

Sierra de la Piedra Movediza; Sierra Tolosa, Argentina (Holmberg).

Eudioptus aguirrei DOER., Actes Acad. Nac. Ciencias en Cordoba, v, p. 112, pl. 2, f. 2 (1884).

Allied to an elongated variety of *B. apodemetes*, and to *B. mendozanus* according to Doering. The plate is lacking in our copy of the volume in which it is described. May be a *Lissoacme*.

B. MONTEVIDENSIS Pfr. (p. 68).

Add to synonymy: *Bulimus gelidus* REEVE, Conch. Icon., pl. 76, f. 553 (August, 1849), described as from "Central America?" Mr. E. A. Smith, from an examination of the type, considers it probably identical with the Montevideo variety (Biol. Centr. Amer. Moll., p. 251).

B. POLYMORPHUS (p. 28). Reference should be made to pl. 4, not pl. 5.

B. EXILIS EYRIESII Drouet (p. 39). First reference to plate should read: Pl. 12, figs. 53, 53; not 52, 53.

B. TENUISSIMUS Orb. (p. 64). Omit "pl. 10, figs. 91, 92," and supply: pl. 14, figs. 9, 10.

Genus DRYMÆUS Albers.

D. NAVICULA (p. 186) var. LATERITIUS n. v.

Light red-chestnut, becoming pink on the spire and white toward the apex, *without bands*, except that the base has a blackish stripe

curving from the rimation to the outer basal angle. Prov. Bahia, Brazil.

Species of uncertain subgeneric position.

B. HETEROGRAMMUS (Moricand). Pl. 26, figs. 81, 82.

Shell small, perforate, ovate-oblong, fragile; tawny, irregularly marked with small dark and whitish lines. Aperture ovate, the lip acute, reflexed. Alt. 13, diam. 5 mill. (*Moric.*).

Forest of Caxoeira, Prov. Bahia, Brazil (Blanchet).

Helix heterogramma MORIC., Mém. Soc. Phys. Hist. Nat. Genève, vii, p. 437, pl. 2, f. 15–17 (1836).—*Bulimus heterogrammus* DESH., in Lam. An. s. Vert., viii, p. 244.—PFR., Monogr., ii, p. 106; vi, 52. —*Bulimulus heterogrammus* BECK, Index Moll., p. 64.

This small species has six whorls, of which the last is as long as all the others together. In texture it is thin and fragile. The surface shows under the lens transverse (spiral) striæ, formed of series of little, extremely short hairs, which make it dull instead of shining. The color is fawn, interrupted by whitish lines alternating with others of a darker fawn. These lines are broken, not regularly distributed, wanting usually on part of a whorl, reappearing again leaving spaces of a uniform fawn without rays. The aperture is oval, lips pale and little reflexed.

Moricand's description and the substance of his remarks are given above. No other author has added to them, or in fact seen the shell so far as I can learn. Its systematic position is doubtful, the sculpture being as in *Rhinus*, but the system of coloring unlike any known species of that group, and the apical sculpture unknown. Possibly a *Protoglyptus*.

B. ROCAYANUS (Orbigny). Pl. 44, figs. 4, 5.

Shell lengthened, imperforate, pyramidal, thin, diaphanous, smooth or at most slightly wrinkled longitudinally; whitish-gray, ornamented with irregular longitudinal lines of white with others of a reddish-brown color. Spire long, with slightly convex lateral outlines, the apex quite acute. Whorls 9, slightly convex, wide. Aperture oblong, irregular, somewhat auriculate, effuse in front, the margins acute and but little expanded; columella sharp, spirally twisted. Alt. 24, diam. 8 mill. (*Orb.*); aperture 9 mill. long.

Woods along the Rio Grande, south of Santa Cruz de la Sierra, Bolivia.

Helix rocayana Orb., Mag. de Zool., 1835, p. 13.—*Bulimus rocayanus* Orb., Voy. Amér. Mérid., p. 277, pl. 33, f. 6, 7.—Pfr., Monogr., ii, p. 35 ; iii, p. 313.

With the form of *B. trichodes, rivasii,* etc., this species differs in completely lacking an umbilicus, and in the sharp spiral columella. It especially resembles *B. montivagus.* It buries itself in the earth in the dry season, and when the rains come climbs large trees. It is rare, and on account of its extreme fragility, difficult to preserve. It is one of the most beautiful species of the region, but is very restricted in distribution.

B. voithianus (Pfeiffer). Pl. 51, figs. 18, 19.

Shell perforate, rather fusiform, oblong, somewhat solid ; roughly granulated by longitudinal wrinkles and concentric impressed lines; dull white. Spire conic, the apex rather acute. Whorls 6 to 7, a trifle convex, the last a little shorter than the spire. Columella subvertical, blackish-chestnut. Aperture narrow, oblong, chestnut colored inside; peristome simple, unexpanded, the terminations joined by a brown callus; columellar margin dilated, reflexed, overhanging, not covering the deep perforation. Alt. 19, diam. 7½; alt. of aperture 9½ mill. (*Pfr.*).

Chili (Gay, Bridges).

Bulimus voithianus Pfr., P. Z. S., 1846, p. 114 (Jan. 26, 1847); Monogr., ii, 210; iii, 431 ; iv, 496; vi, 143; viii, 176.—*Orthalicus* (*Mesembrinus*) *boithyanus* H. & A. Ads., Gen. Rec. Moll., ii, p. 157.—*Bulimus meridionalis* Reeve, Conch. Icon., pl. 21, f. 131 (June, 1848).—*Bulimus feisthameli* Hupe in Gay, Hist. Chile, viii, p. 114, Atlas, pl. 3, f. 7 (1854).

"Of a cylindrically oblong form, its dead white surface curiously engraved with obtuse or obsolete scales, and the interior stained with a deep purple-red color. The columella has an angular prominence." The exact locality is unknown. As the apex has not been examined, the subgeneric reference of the species is doubtful. It may be a *Bulimulus* of the section *Peronœus* or *Lissoacme.*

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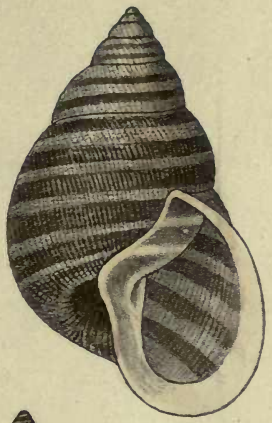

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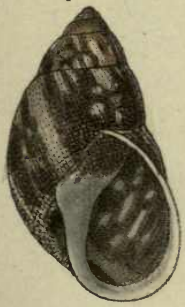

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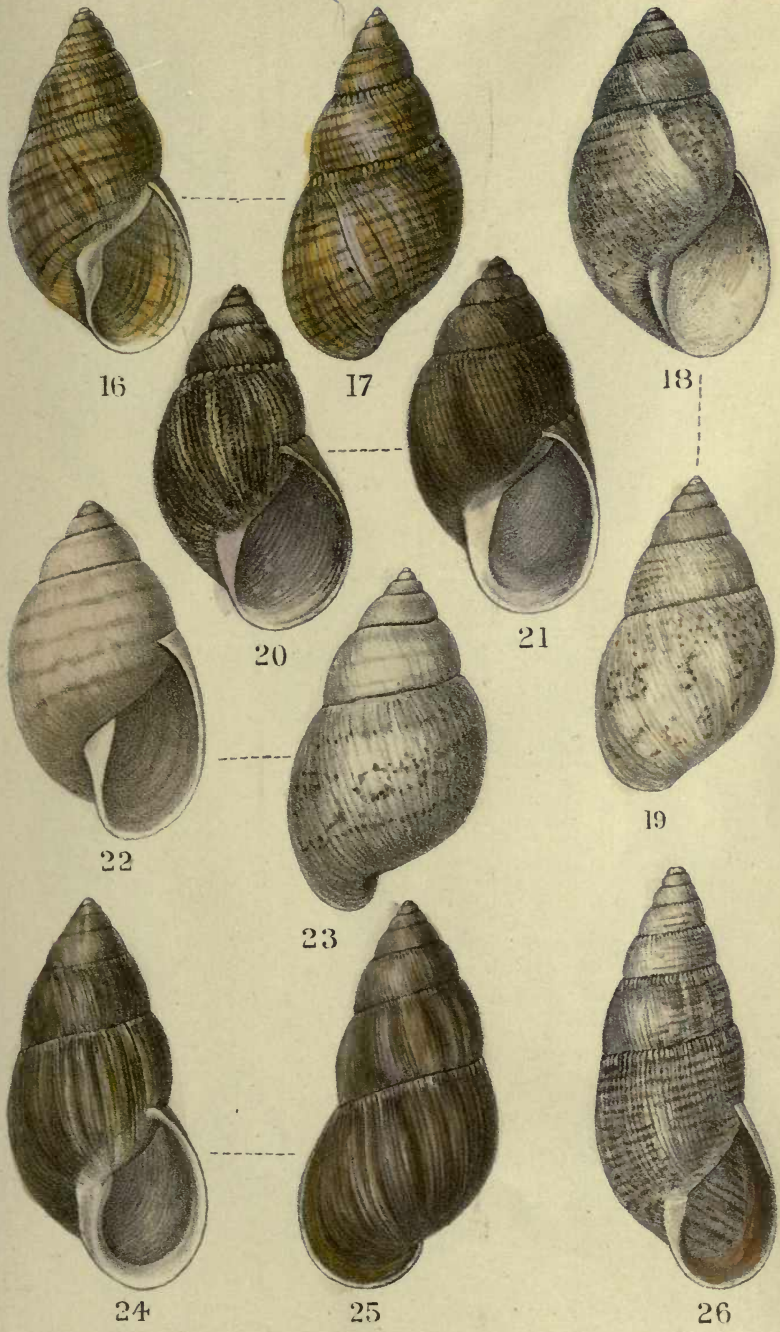
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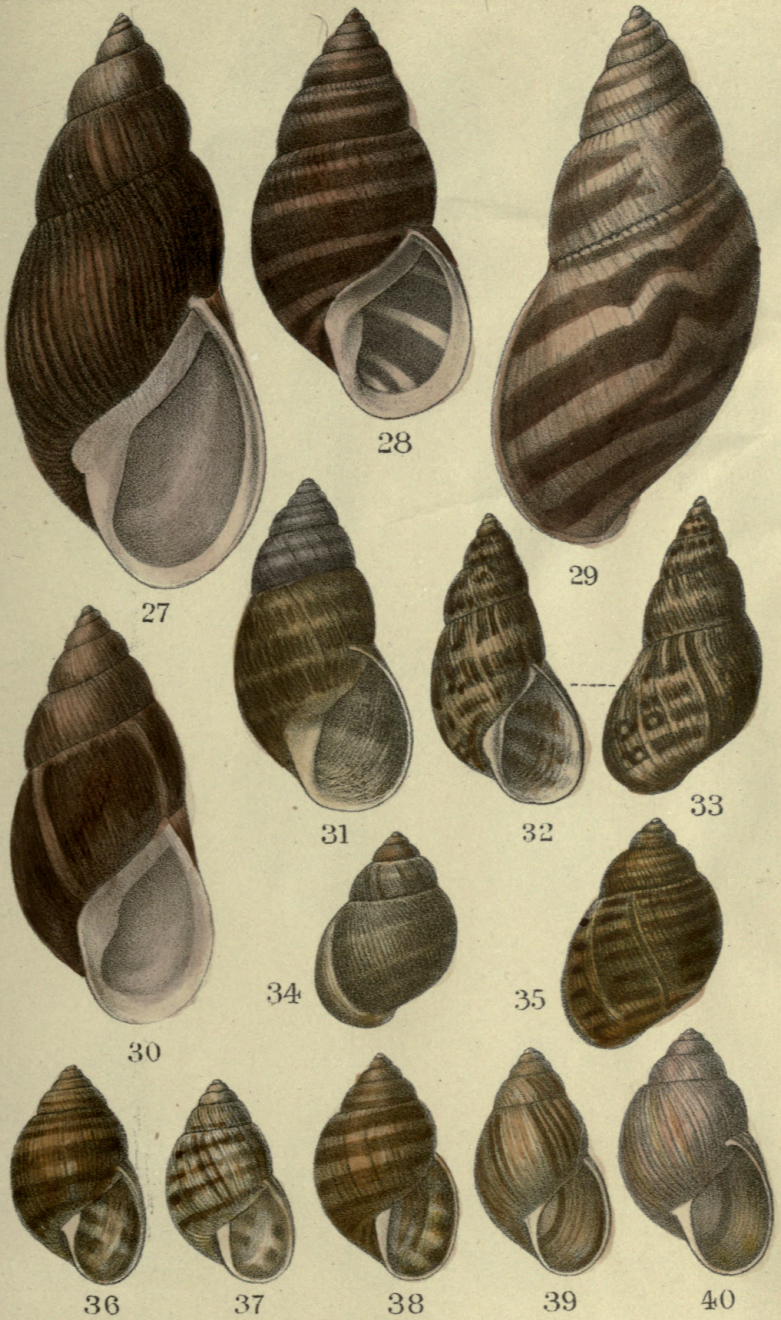
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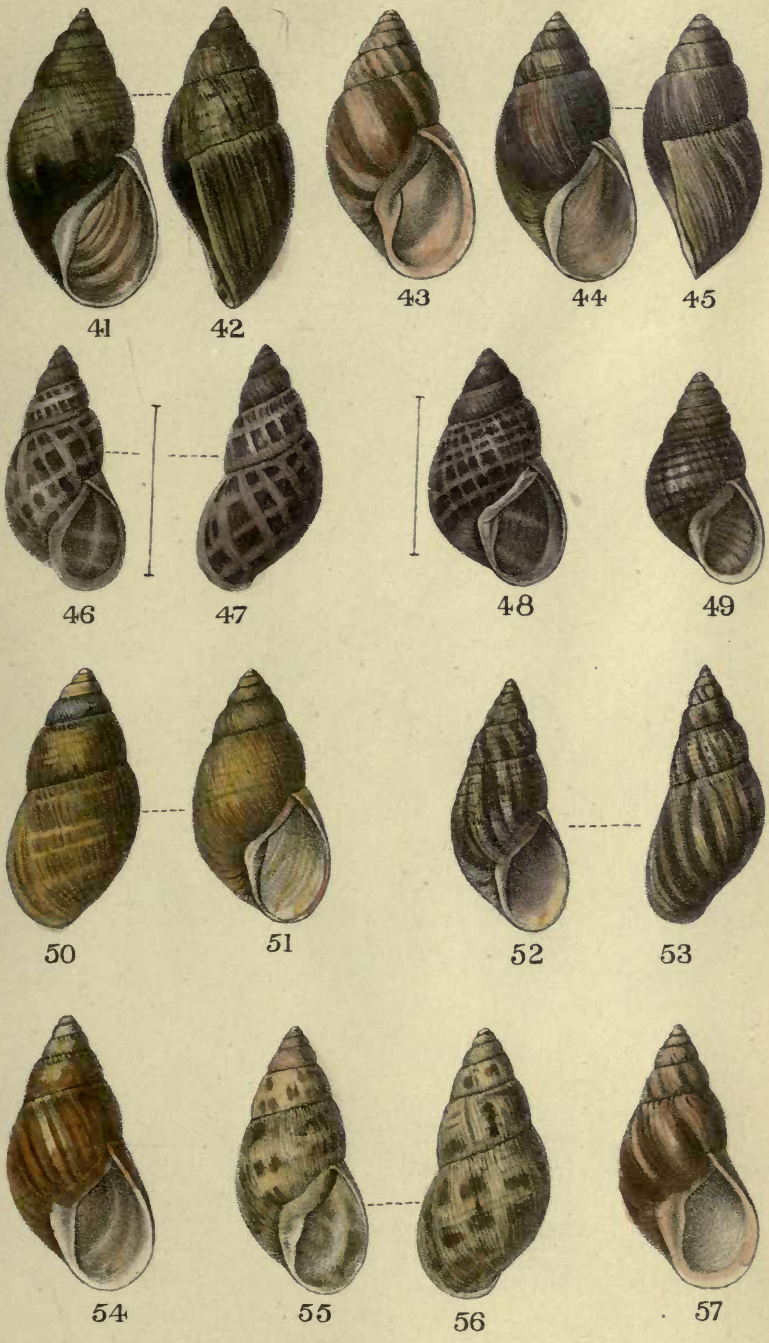
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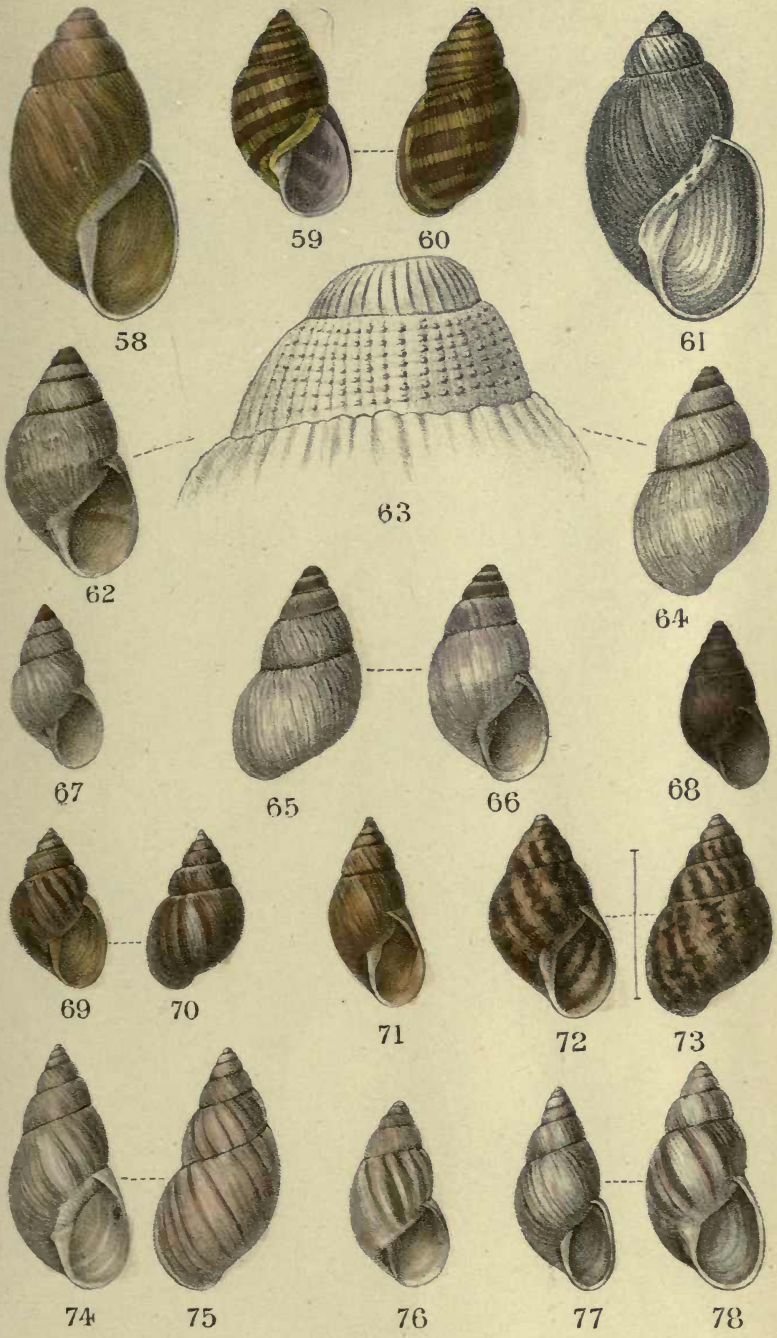
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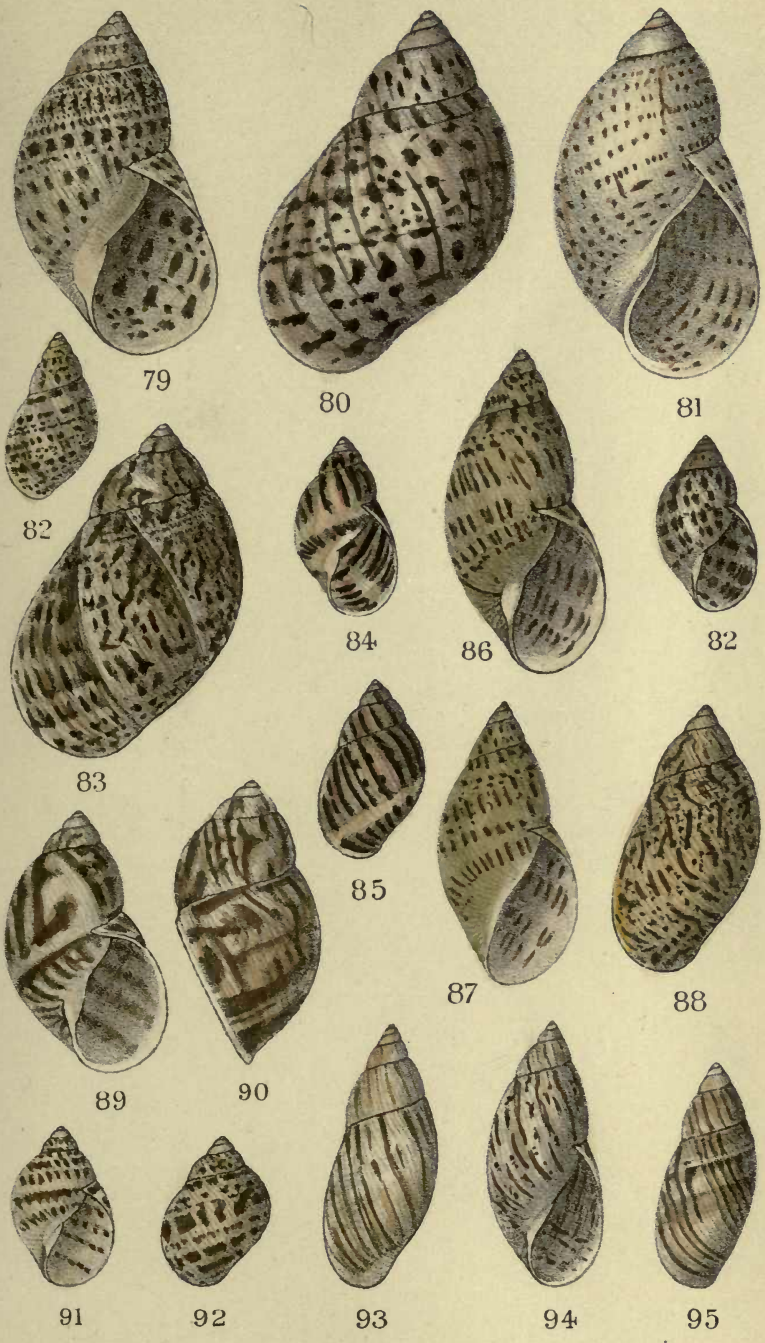
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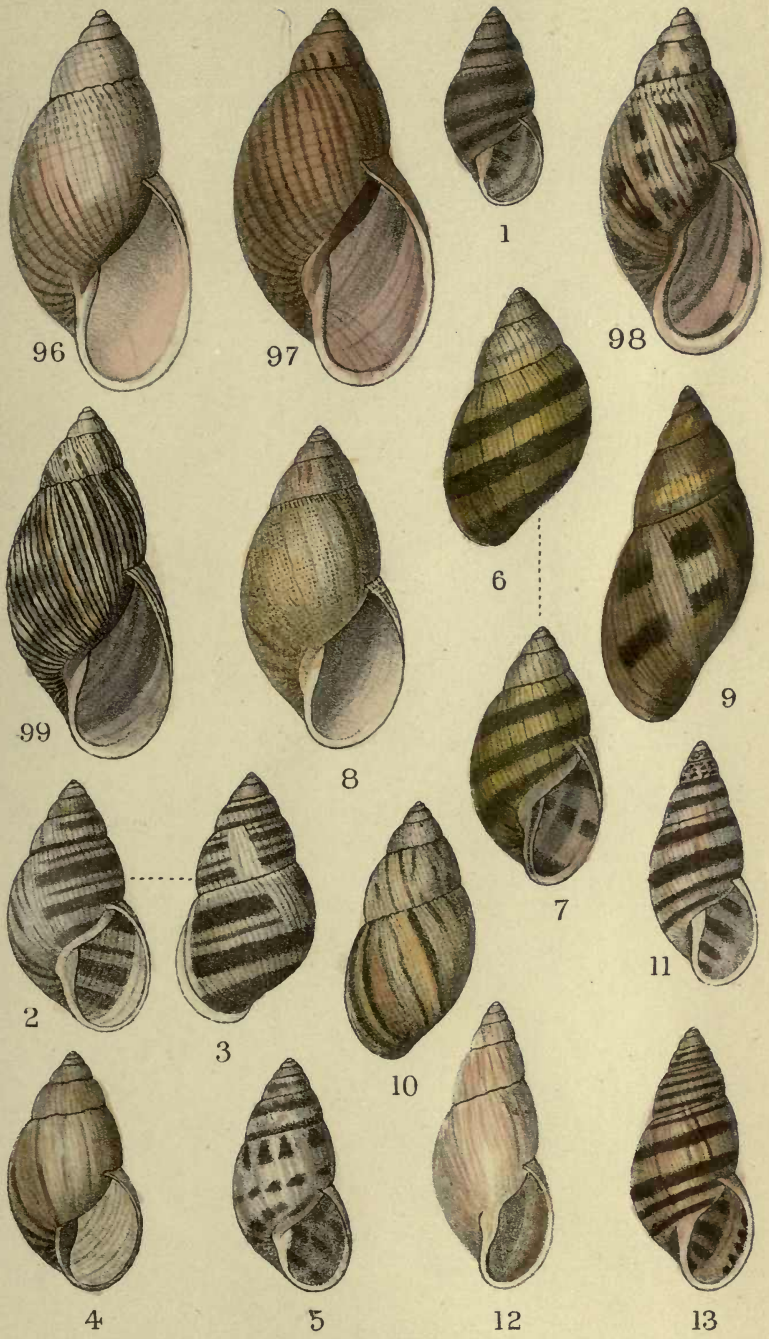
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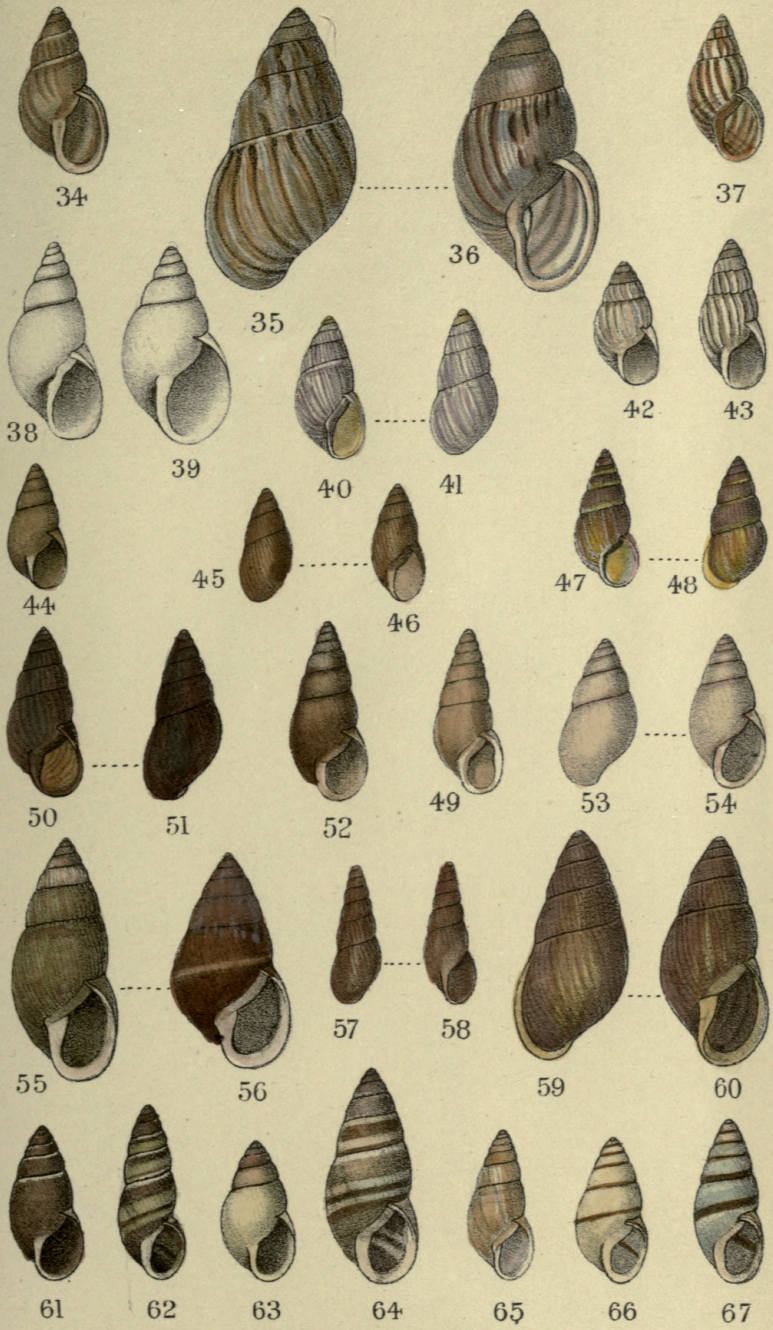
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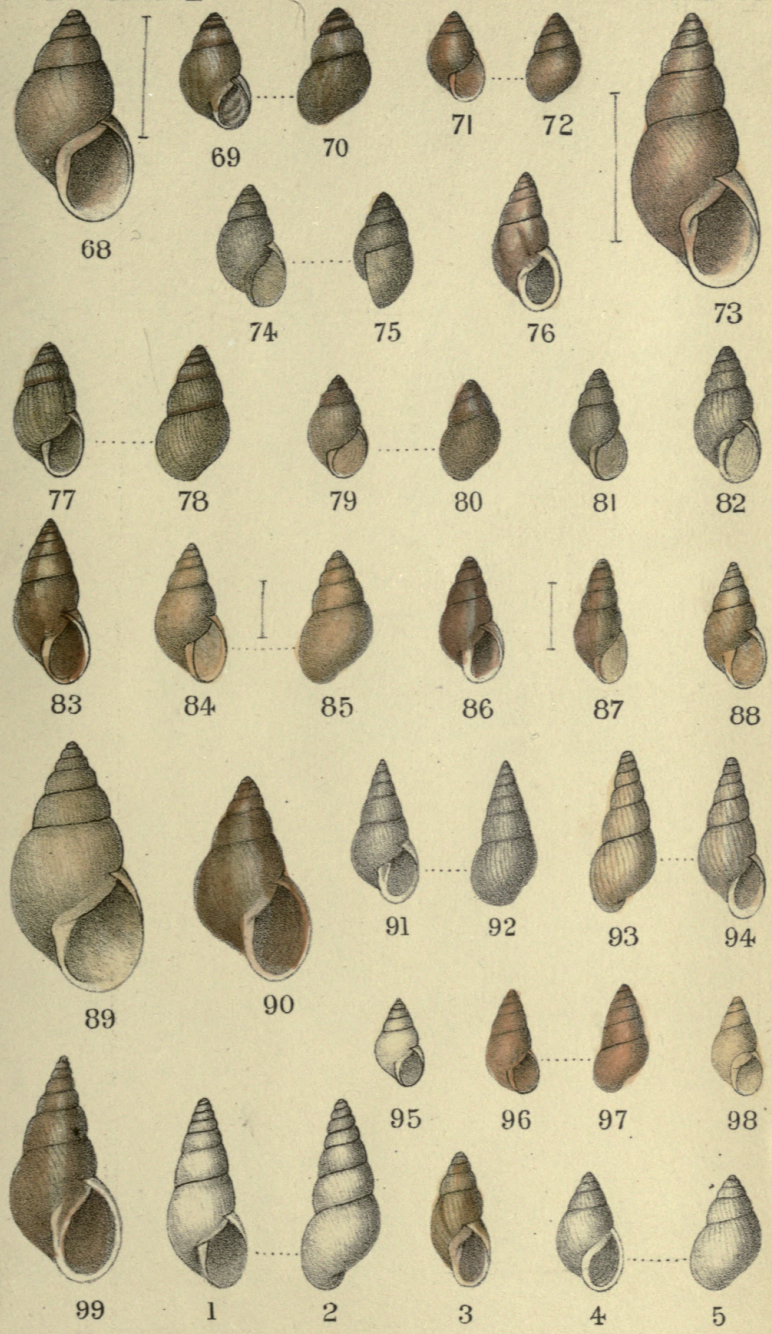
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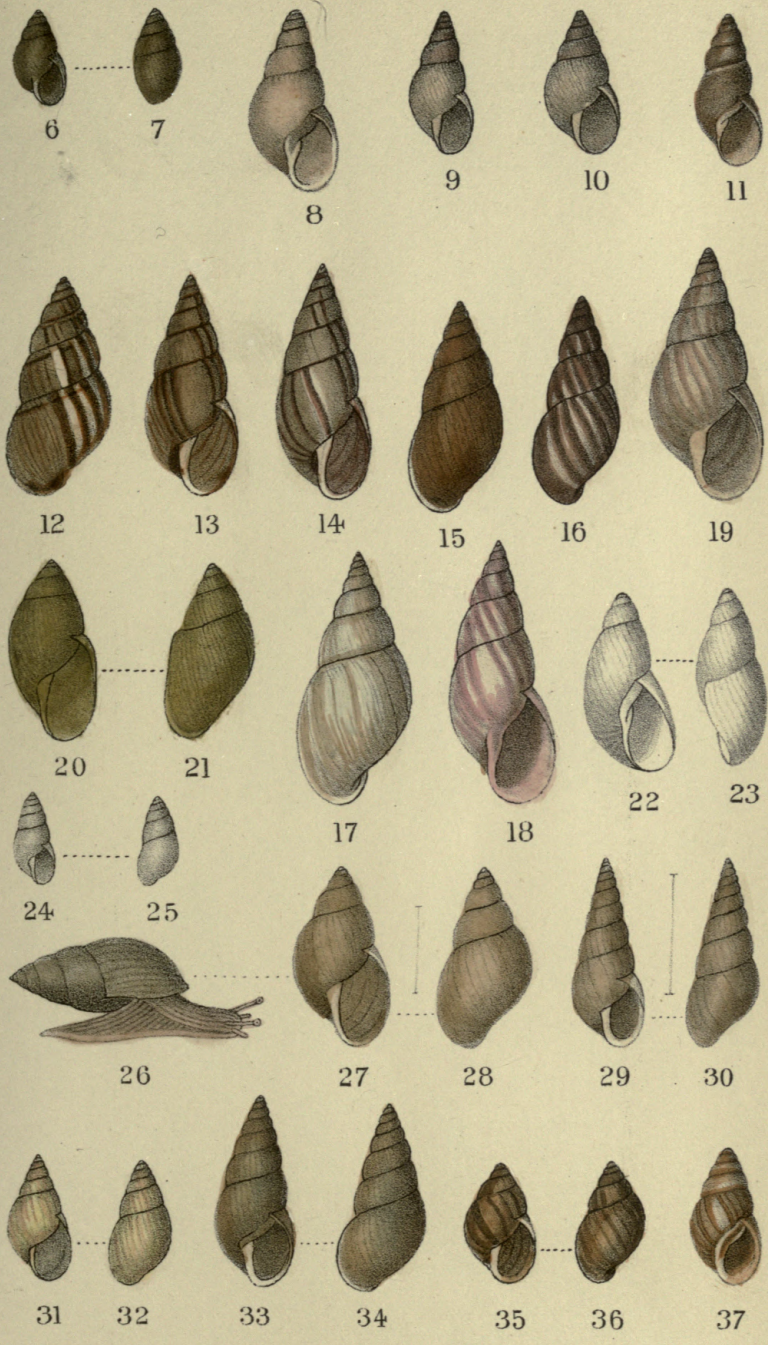
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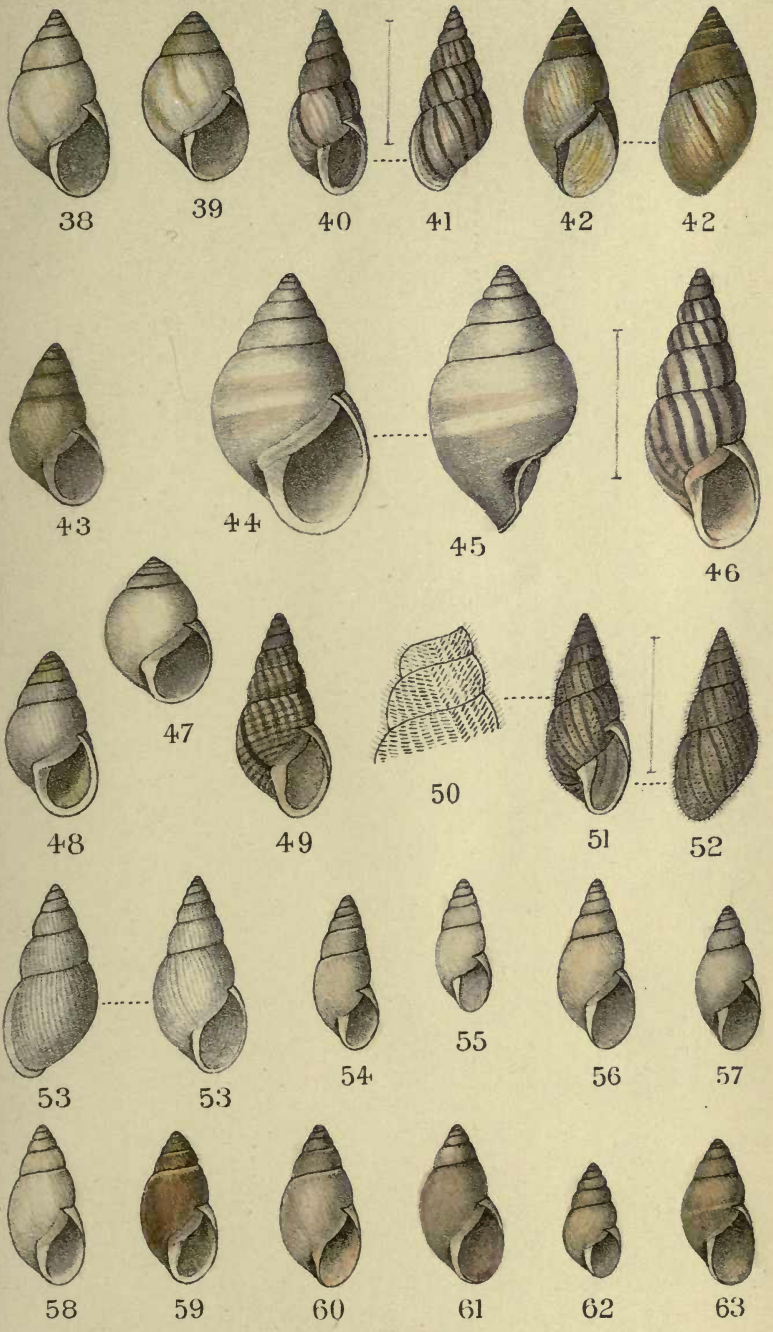
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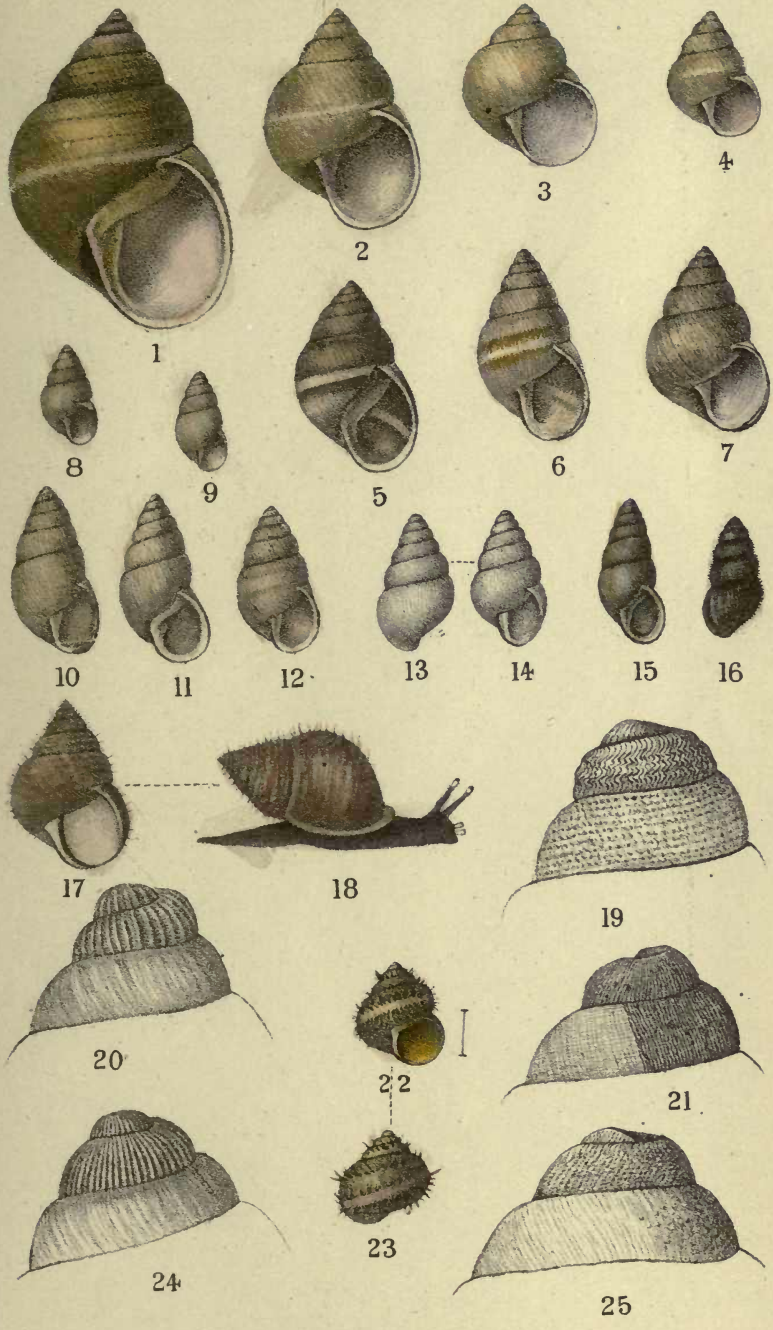
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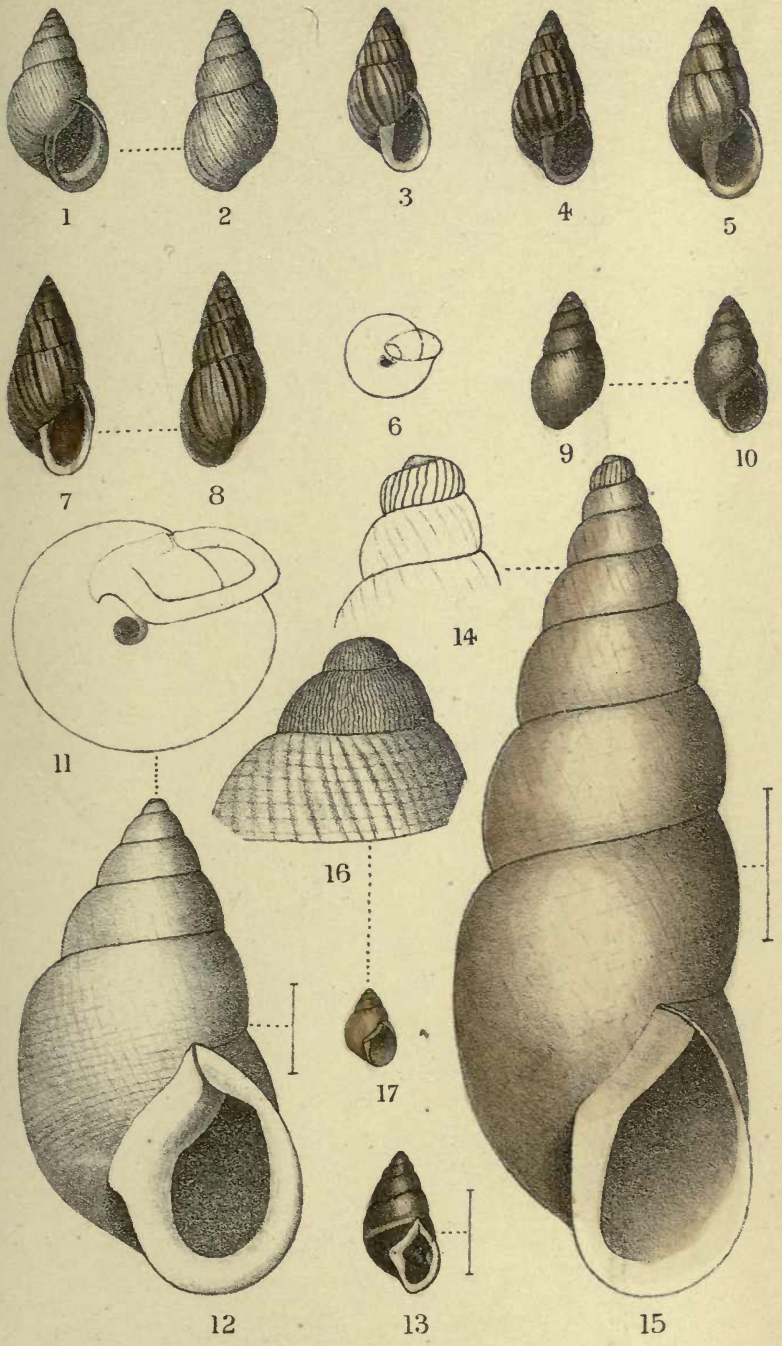
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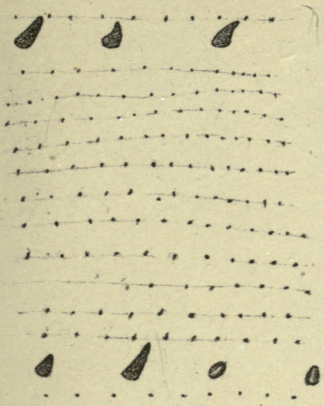

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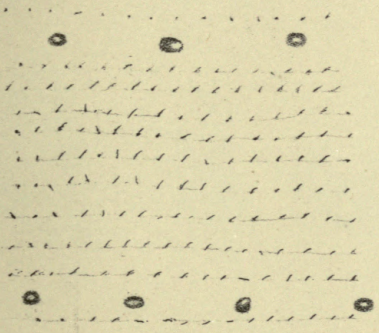

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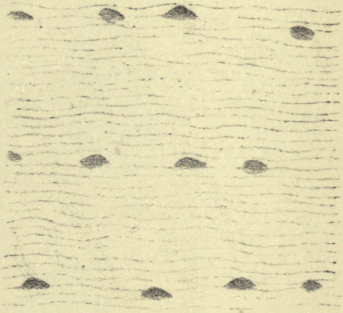

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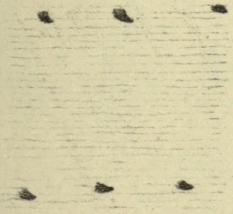

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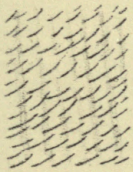

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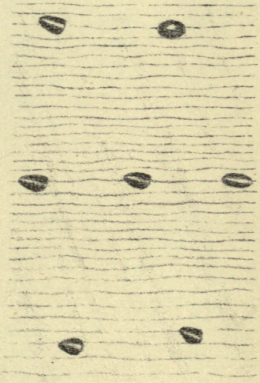

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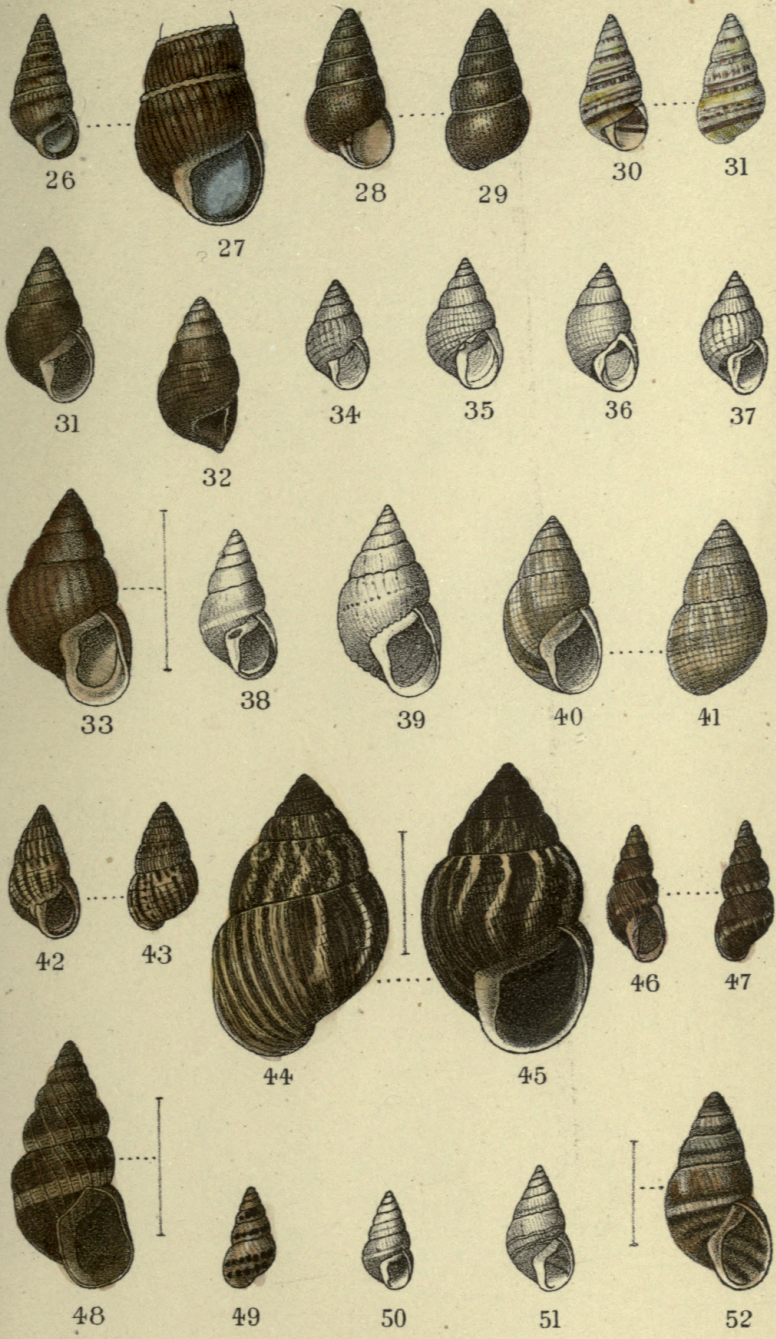
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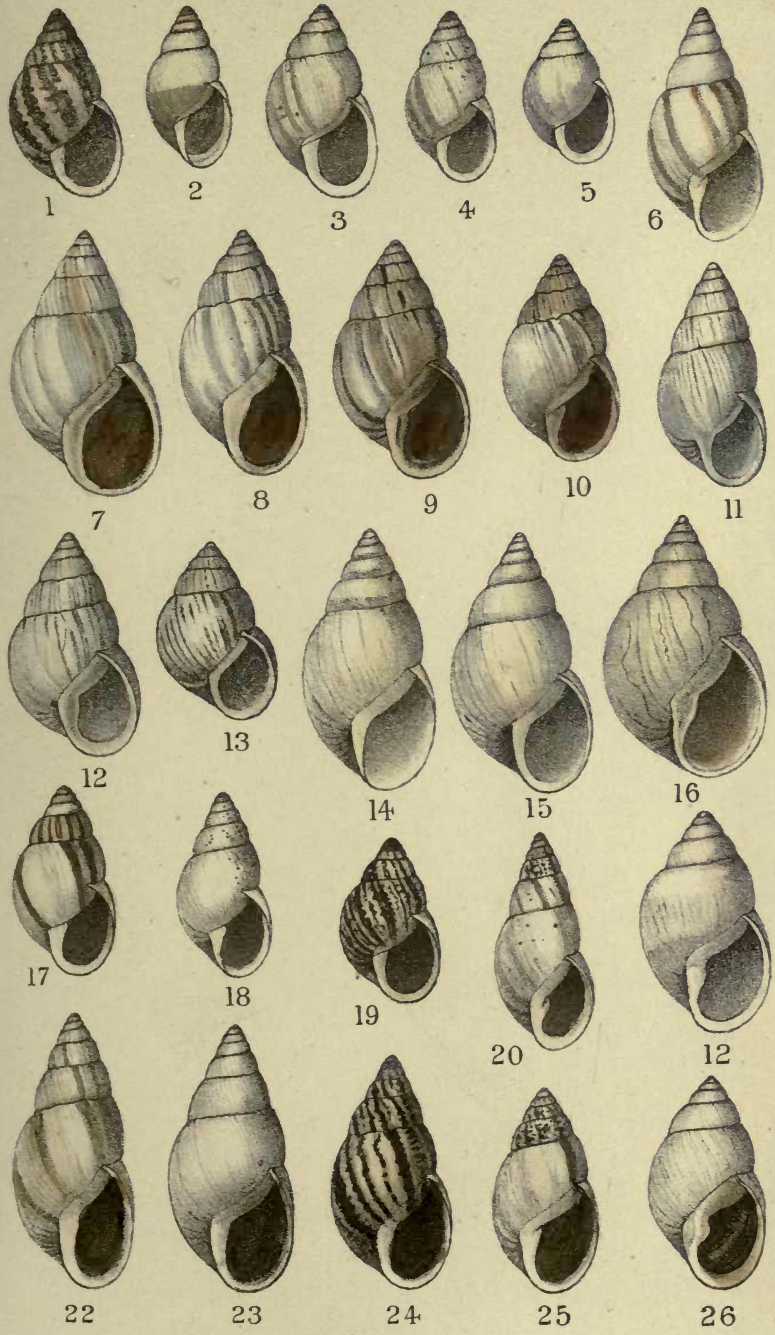
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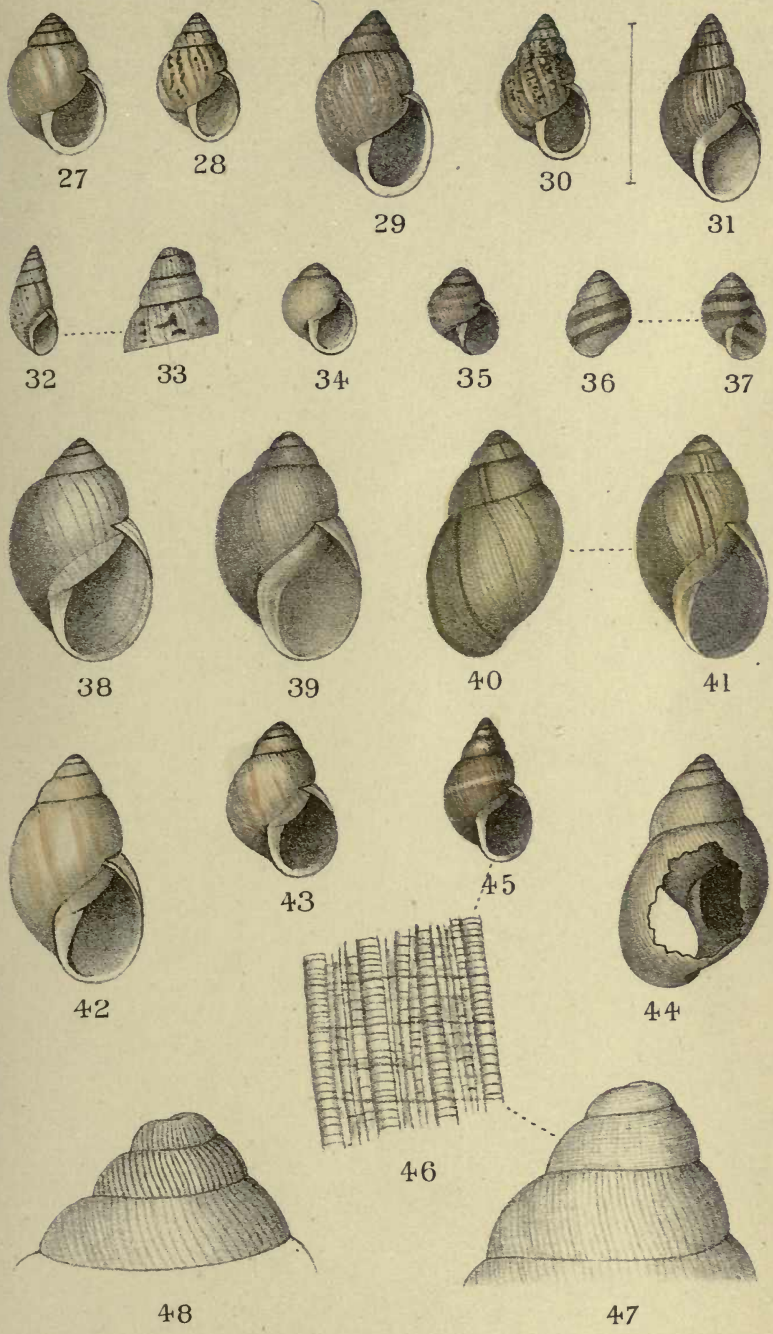
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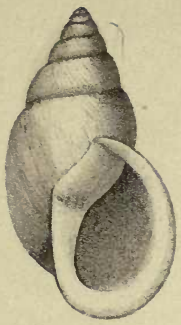
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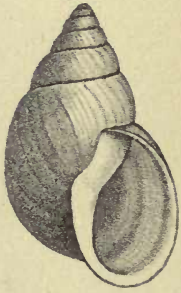
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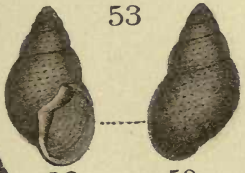
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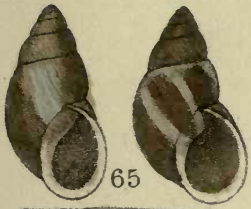
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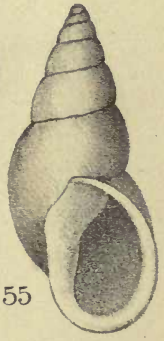
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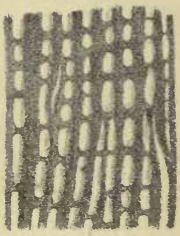
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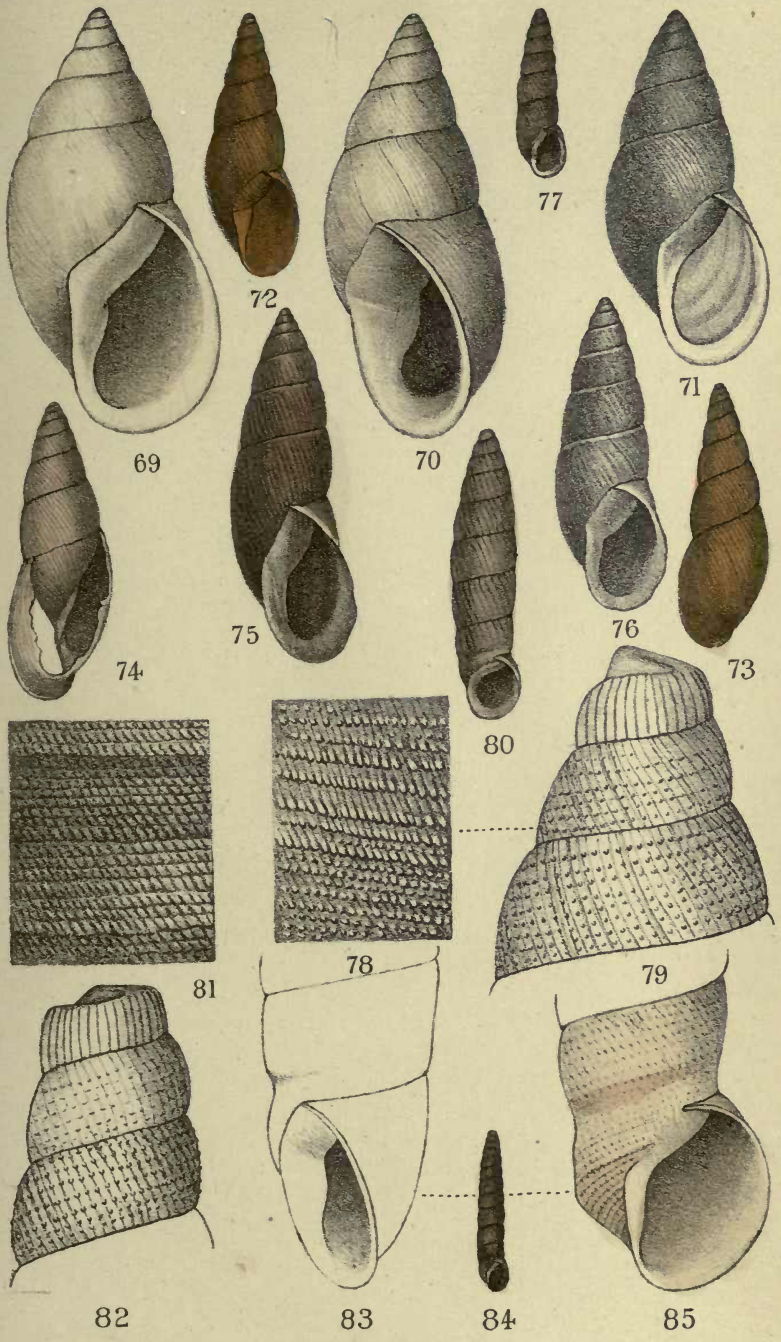
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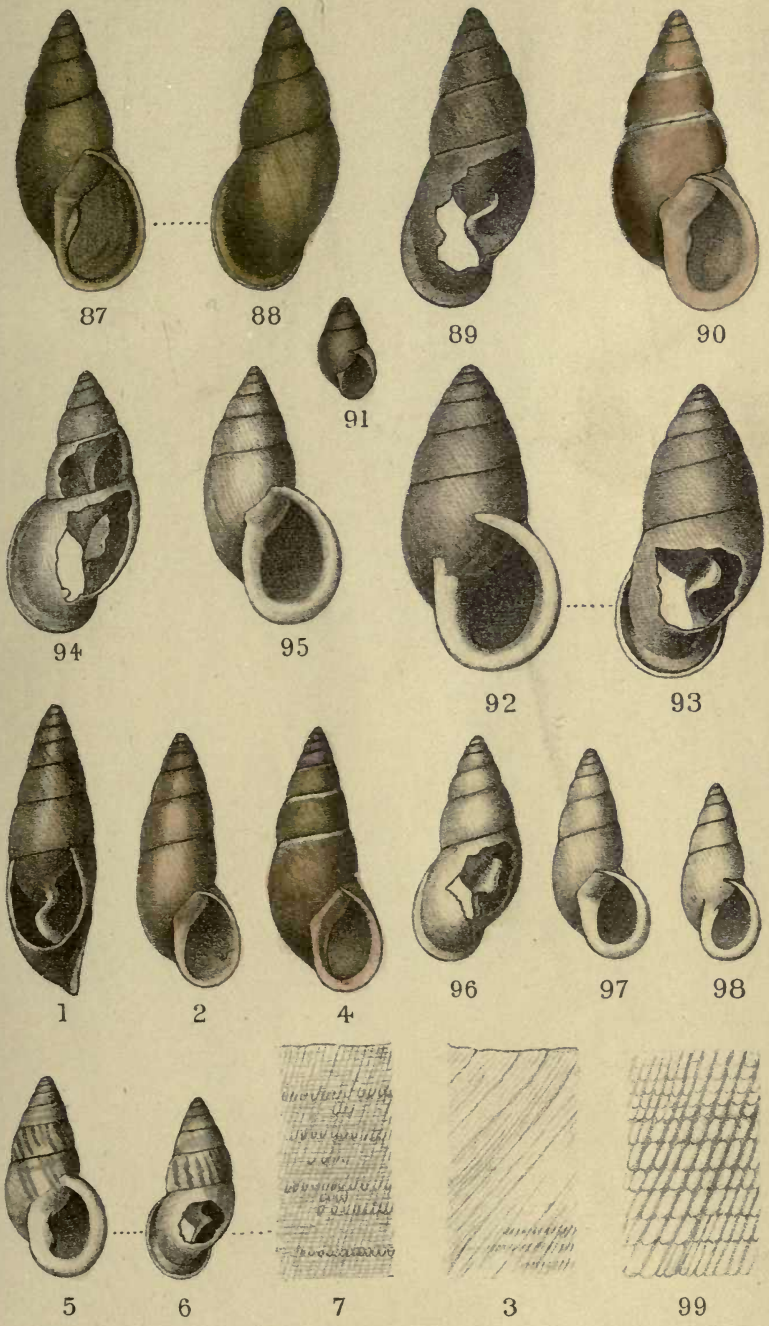
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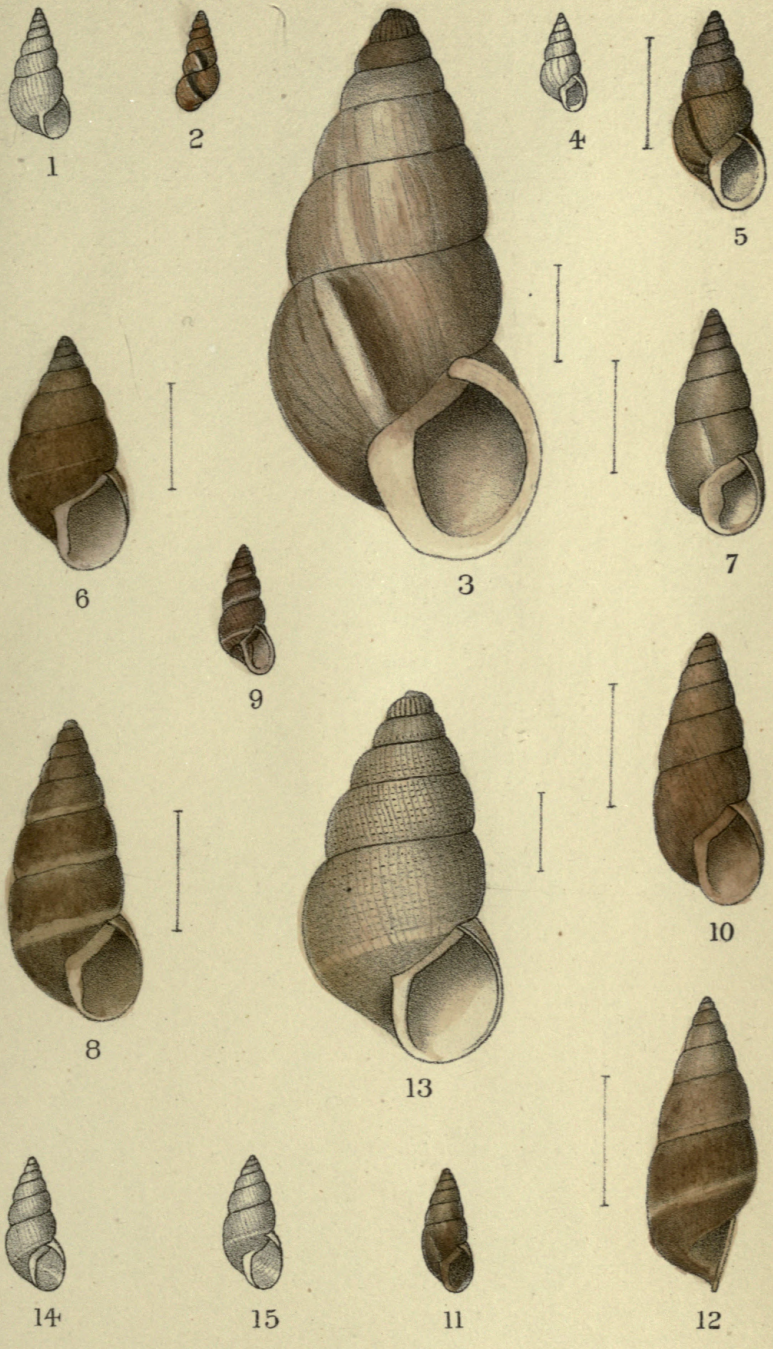
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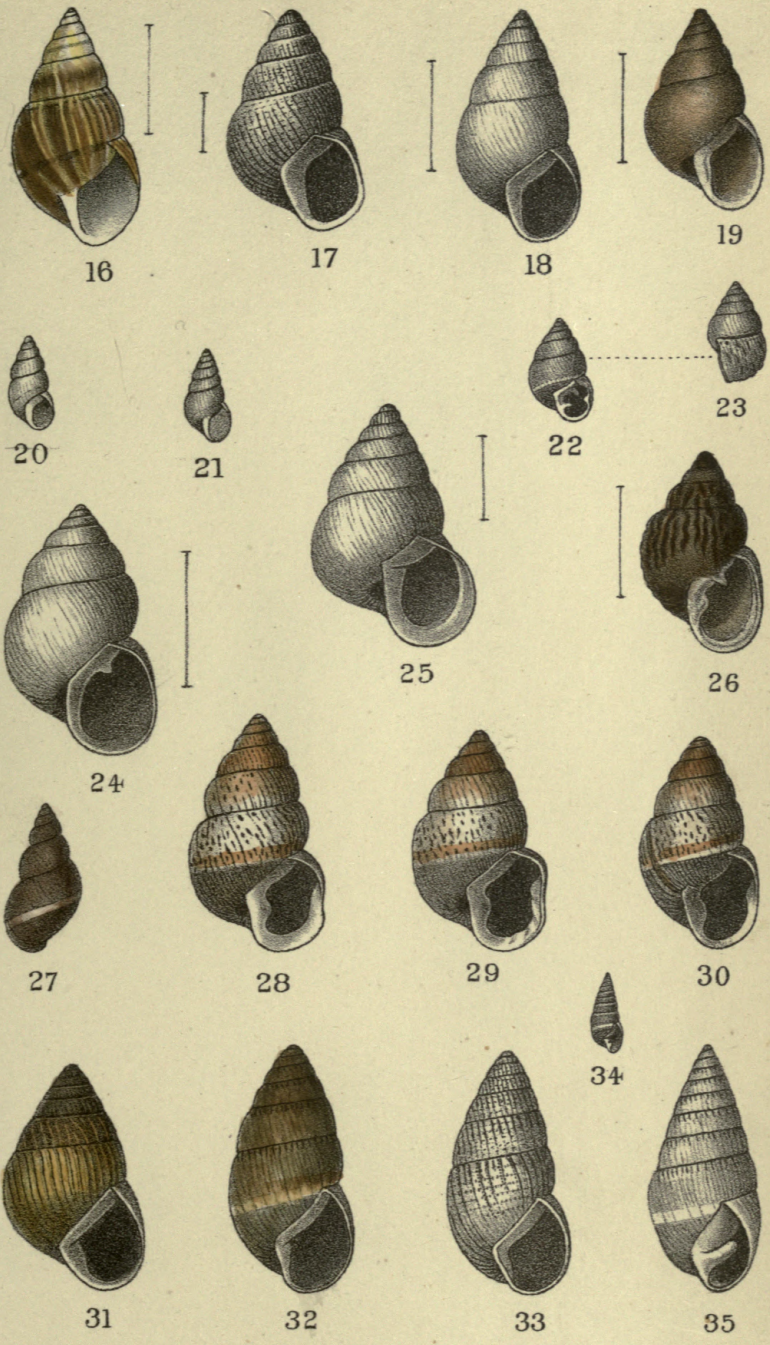
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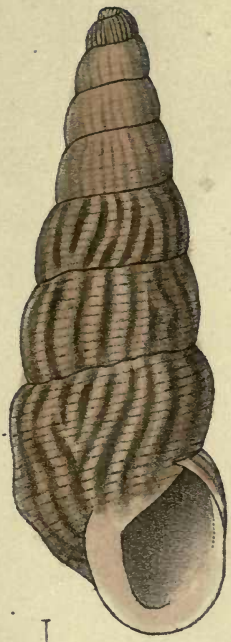

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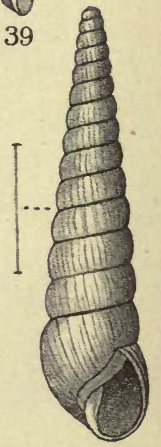

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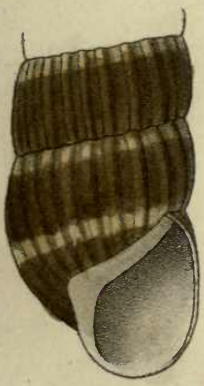

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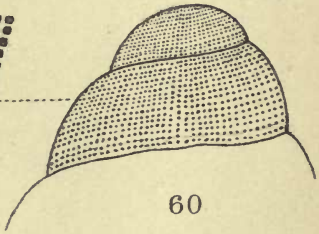

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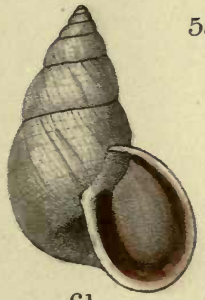

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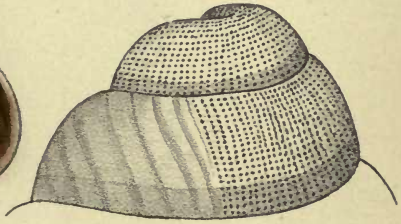

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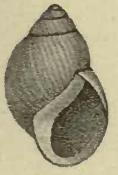

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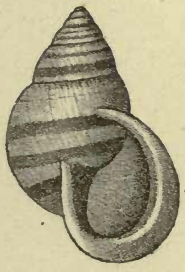

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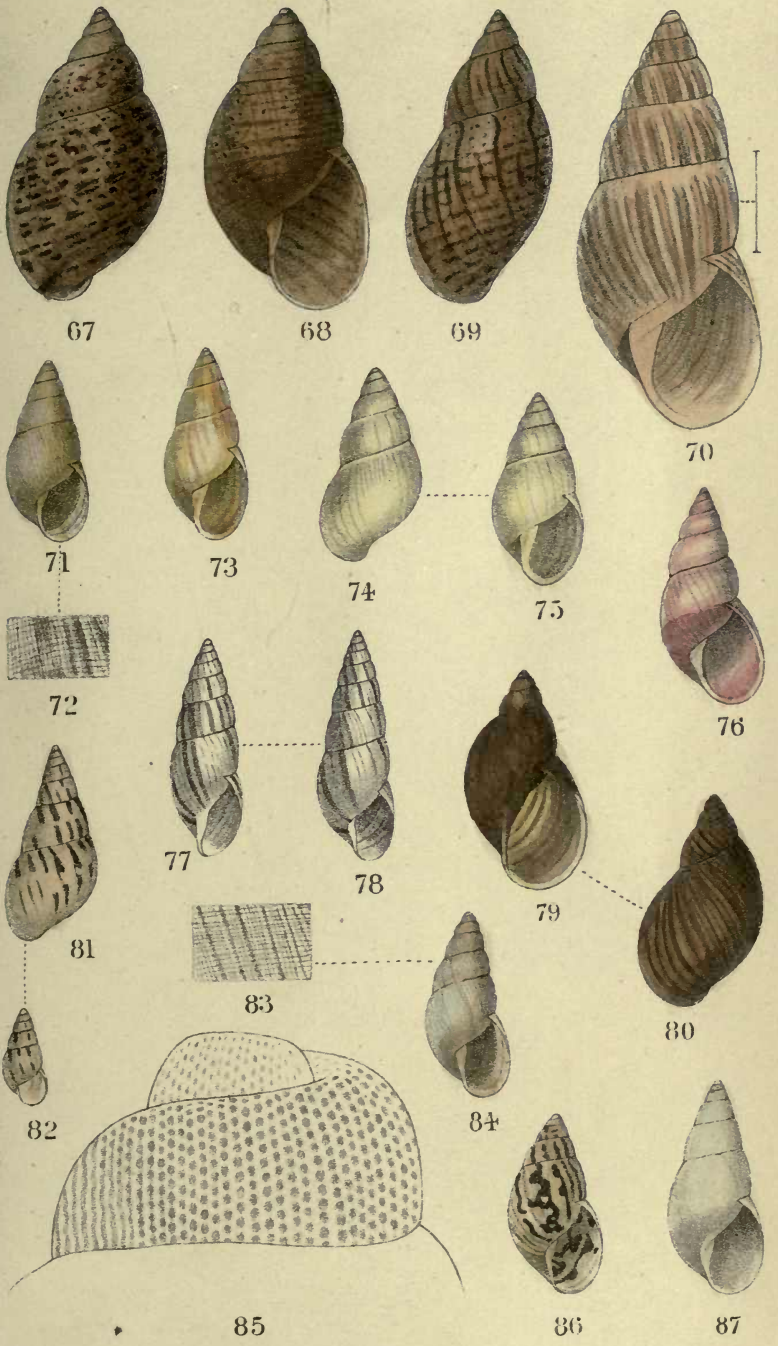
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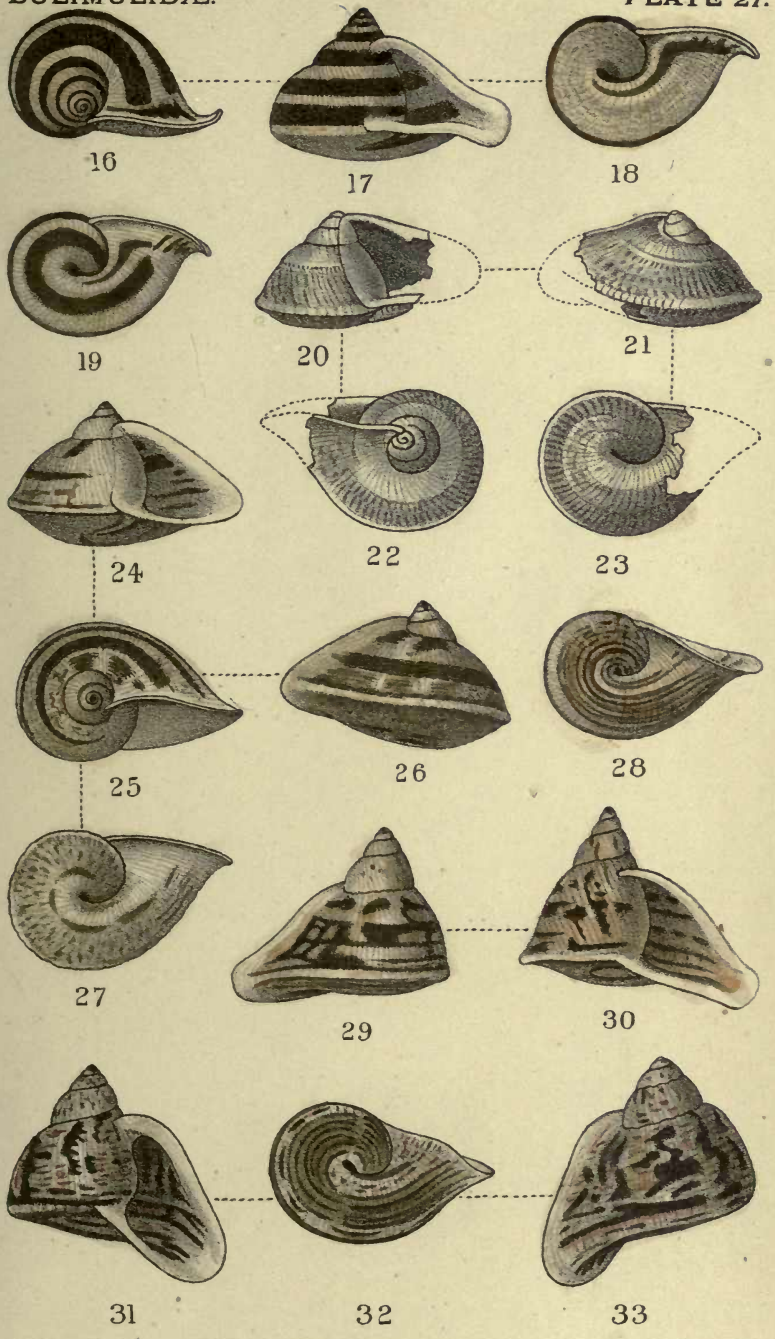
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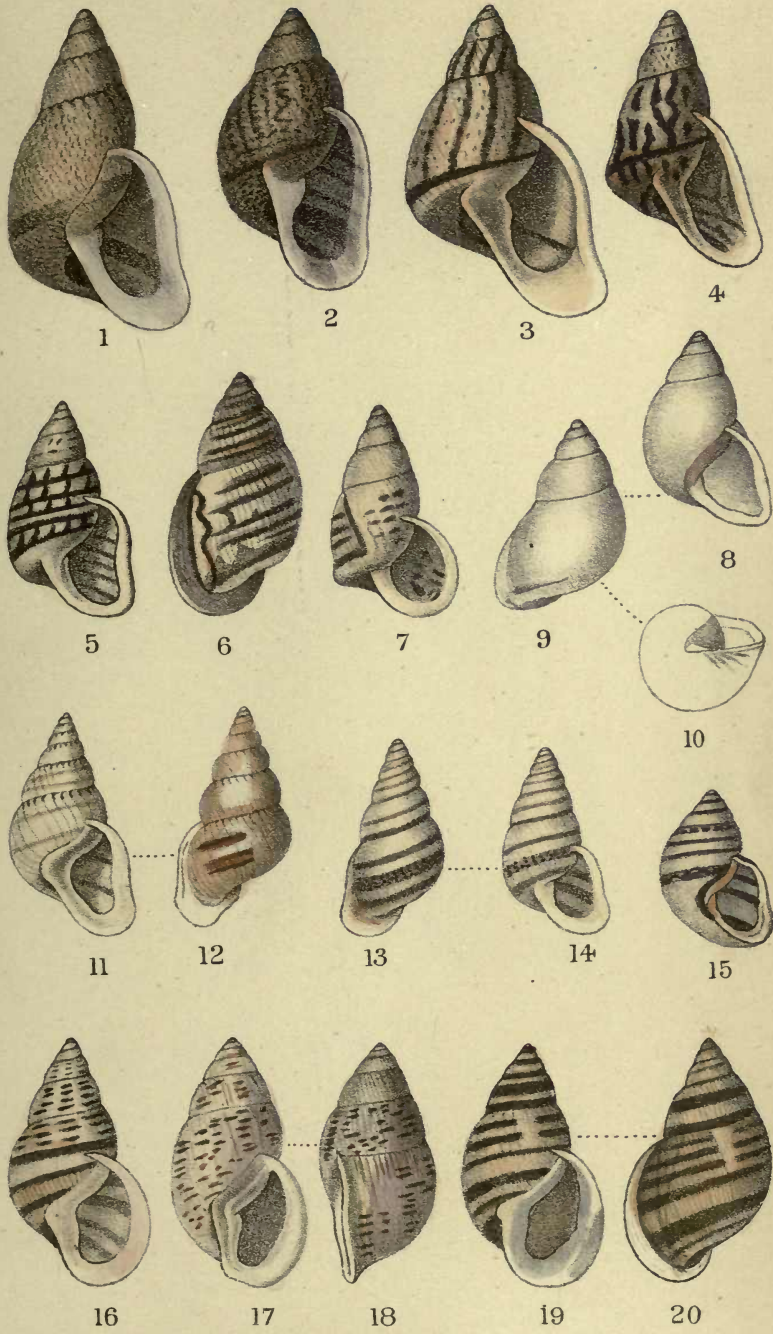
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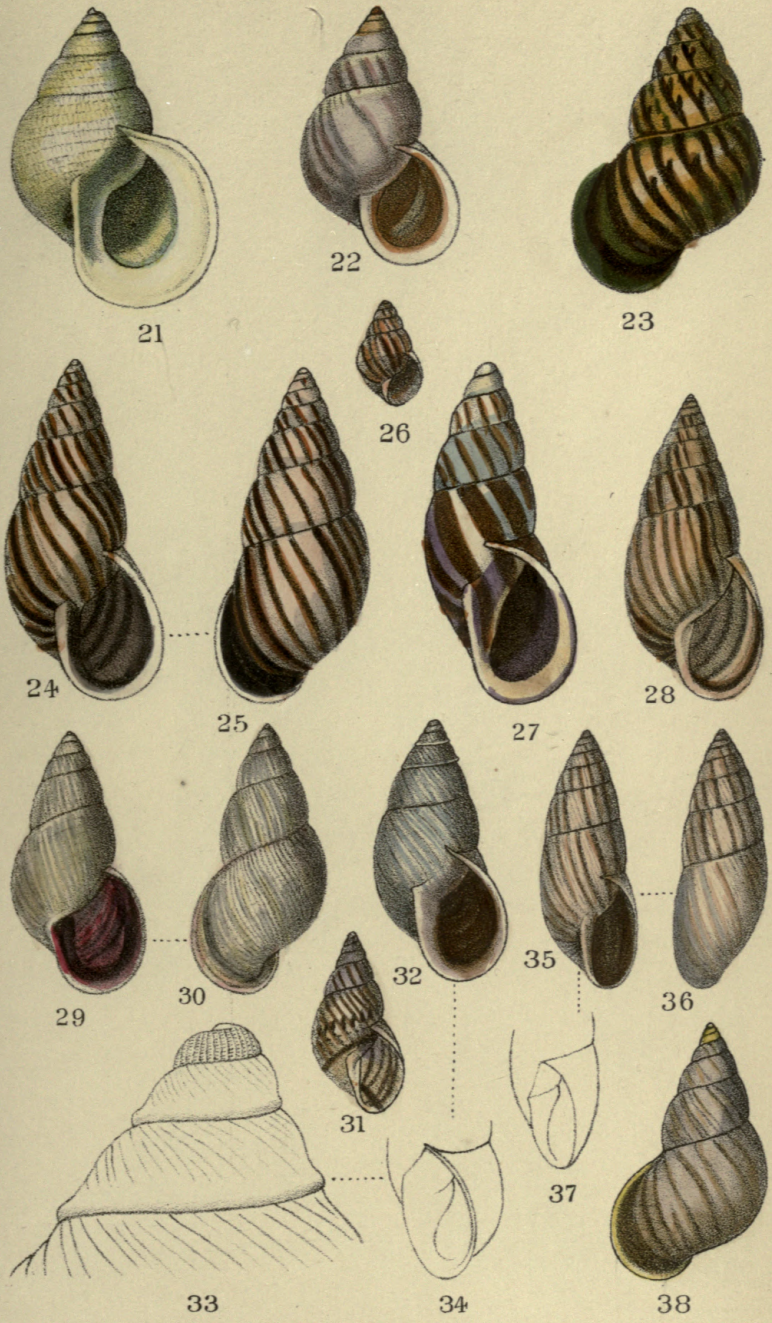
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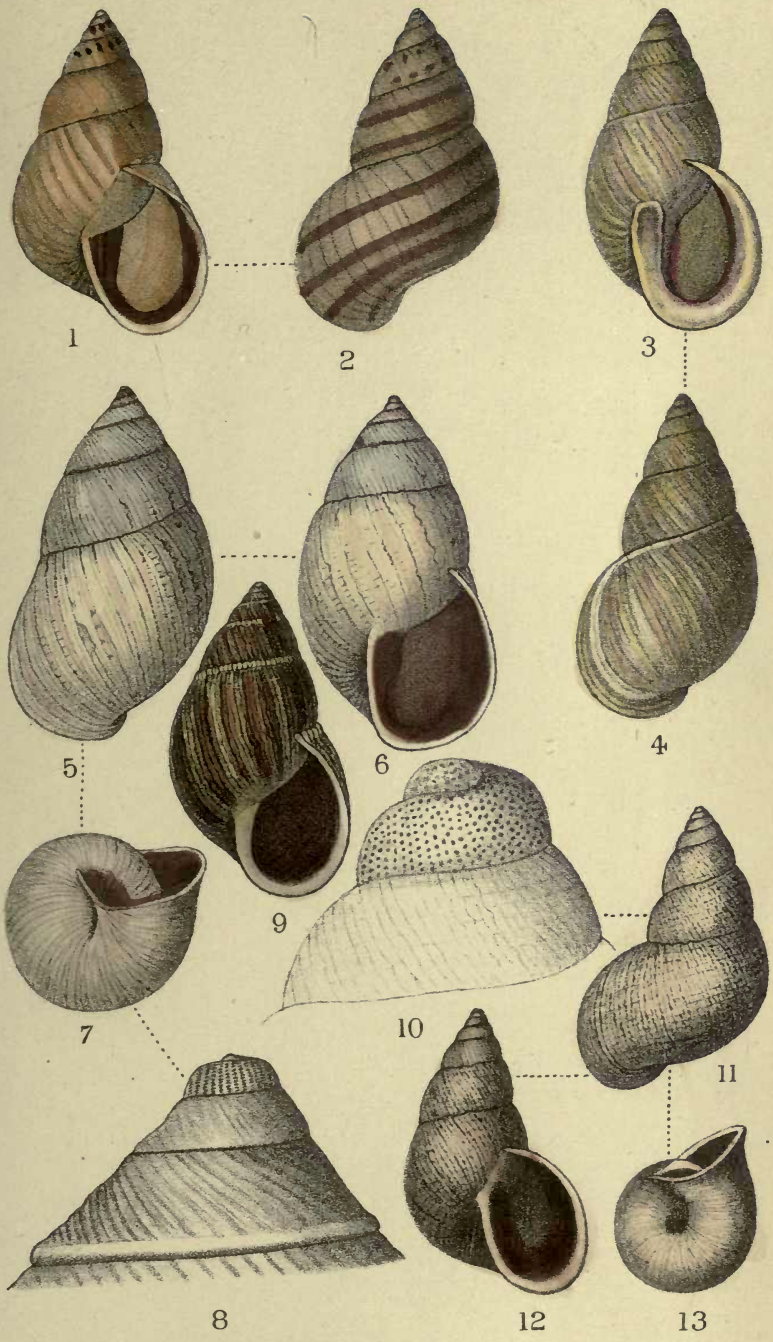
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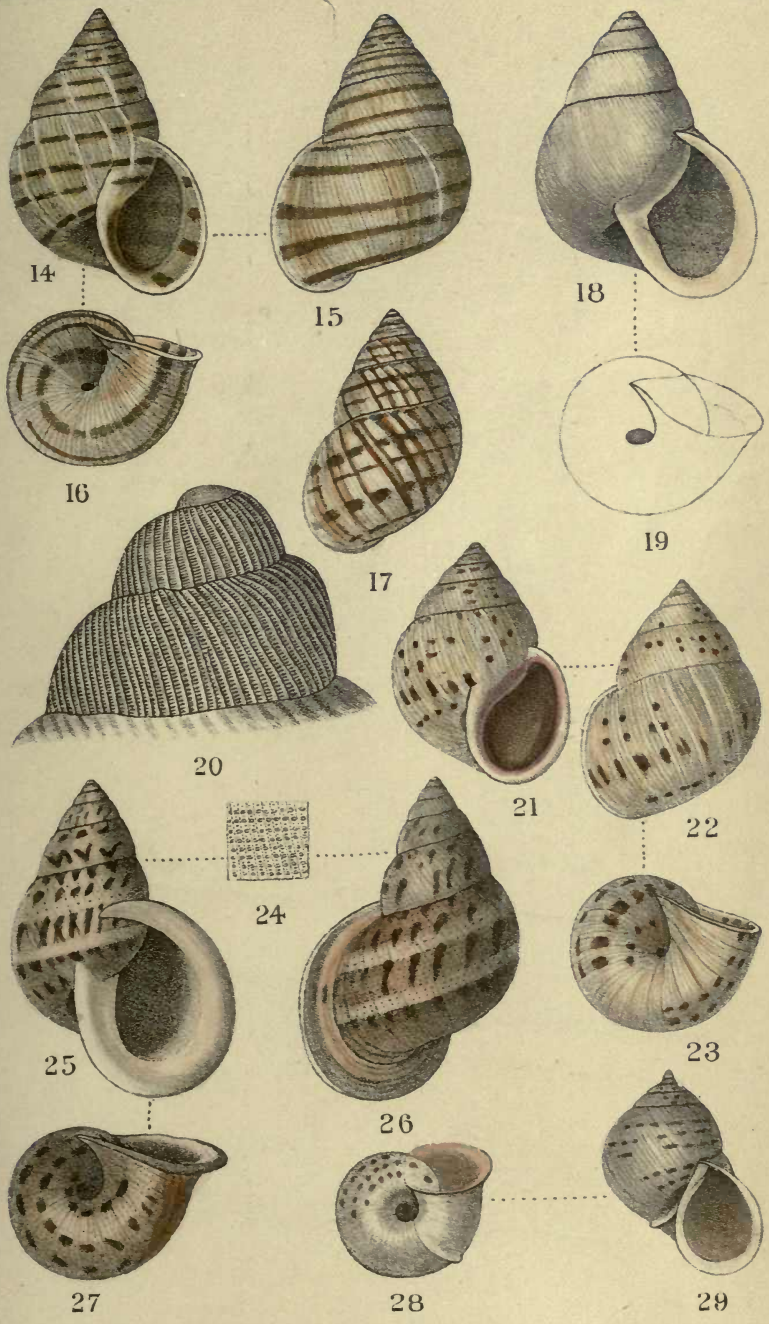
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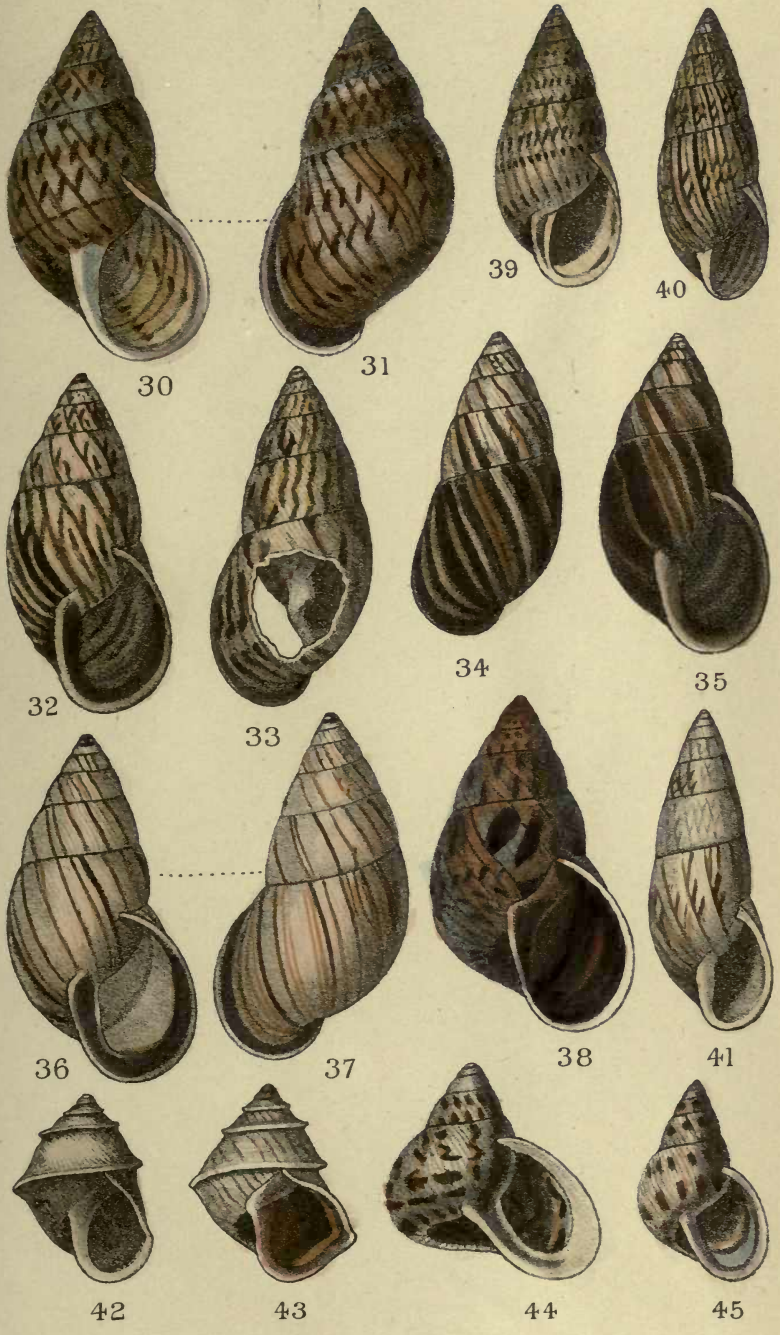
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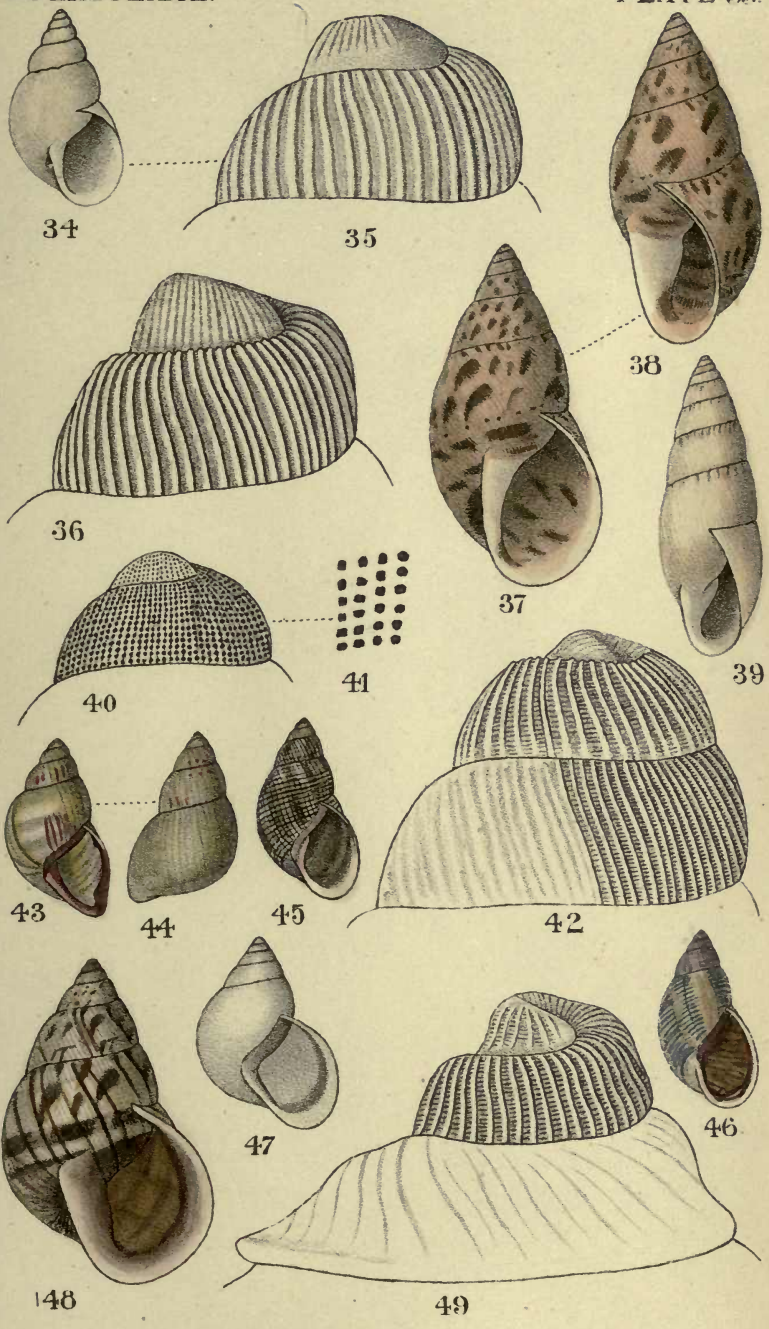
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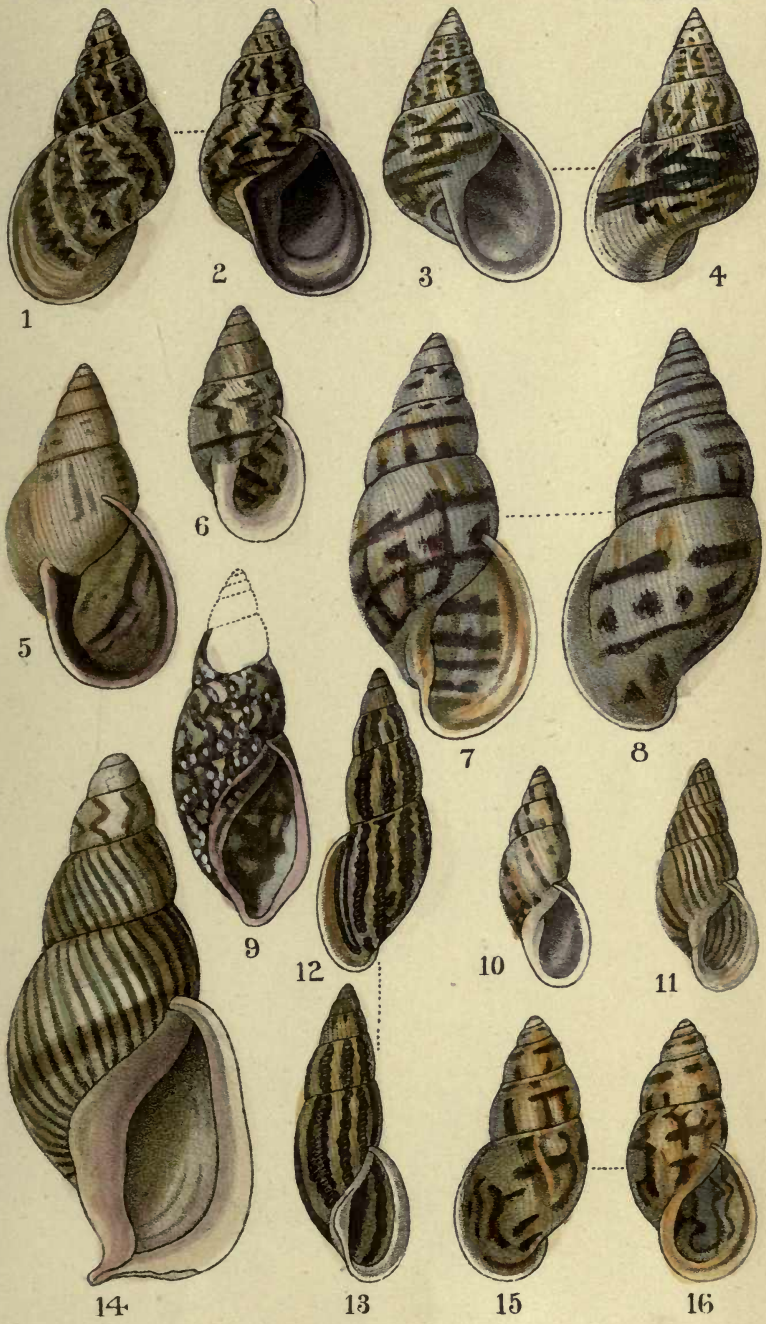
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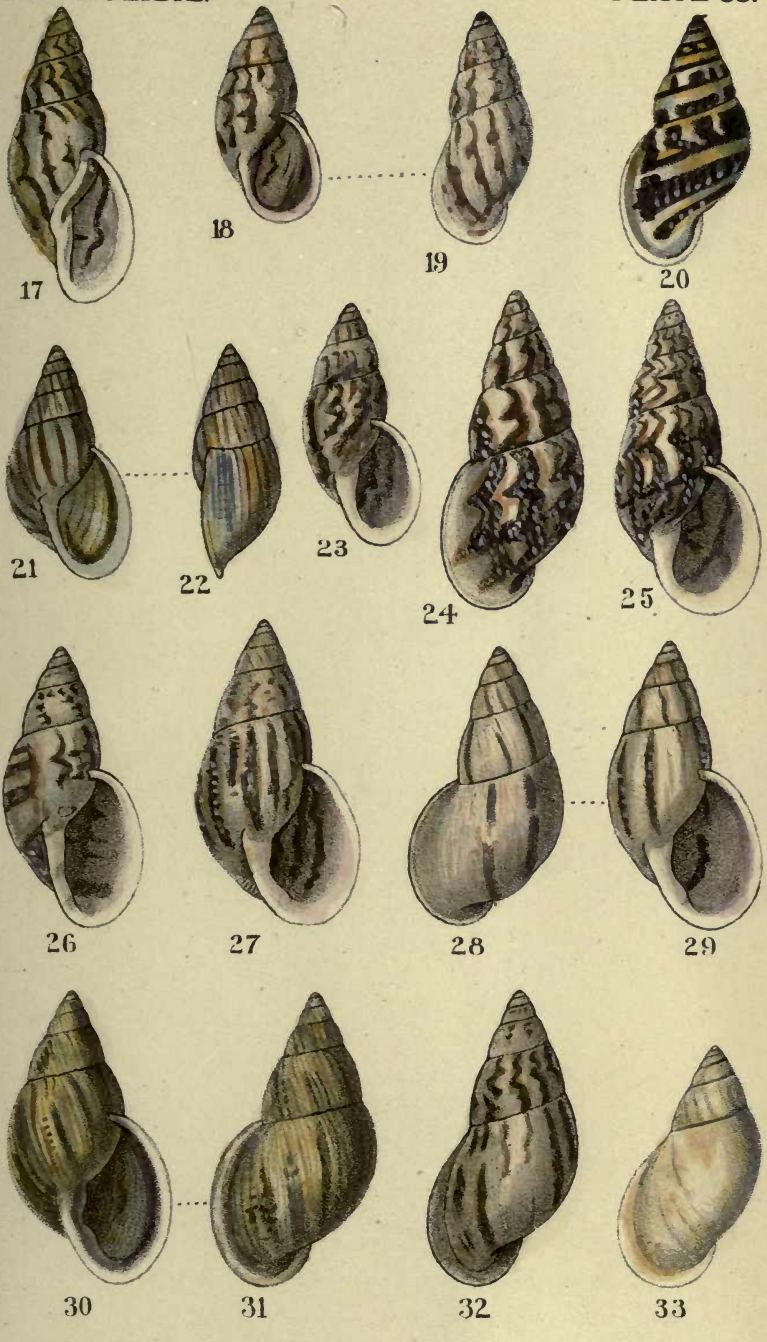
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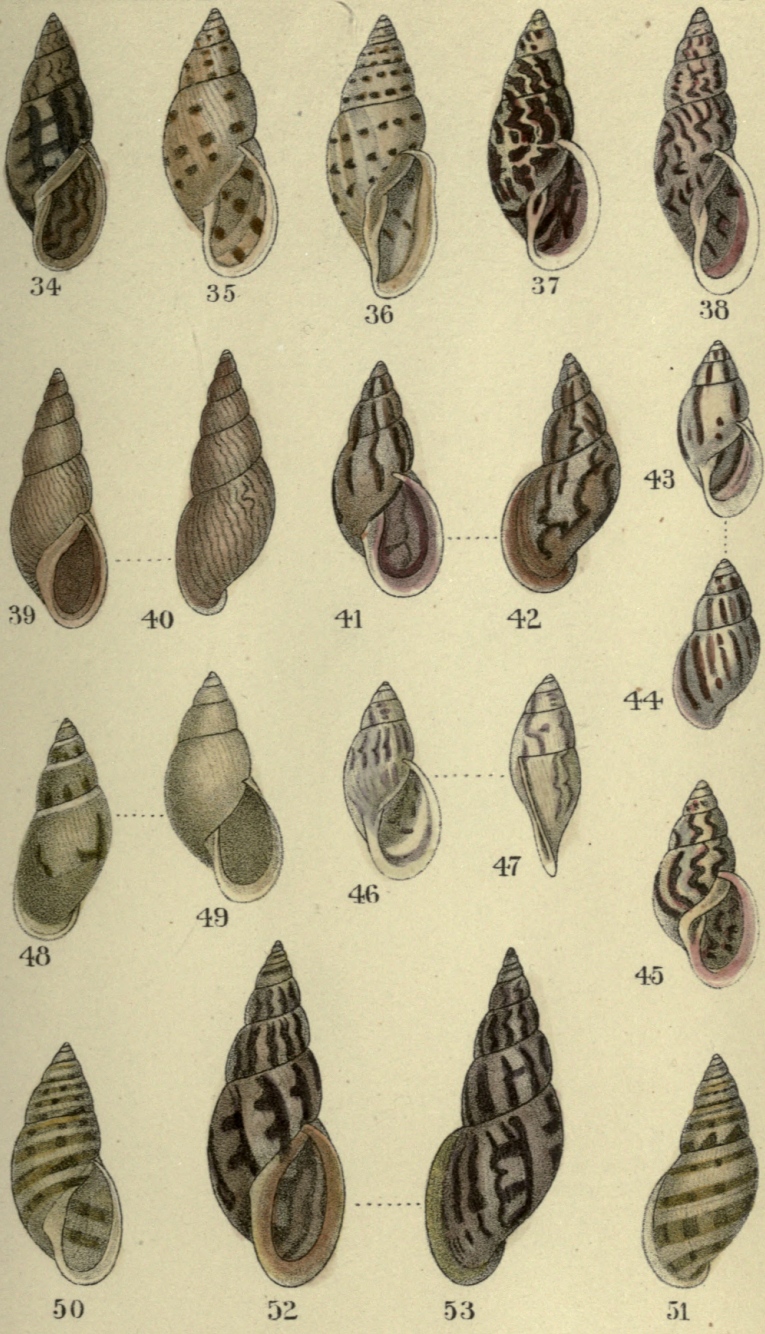
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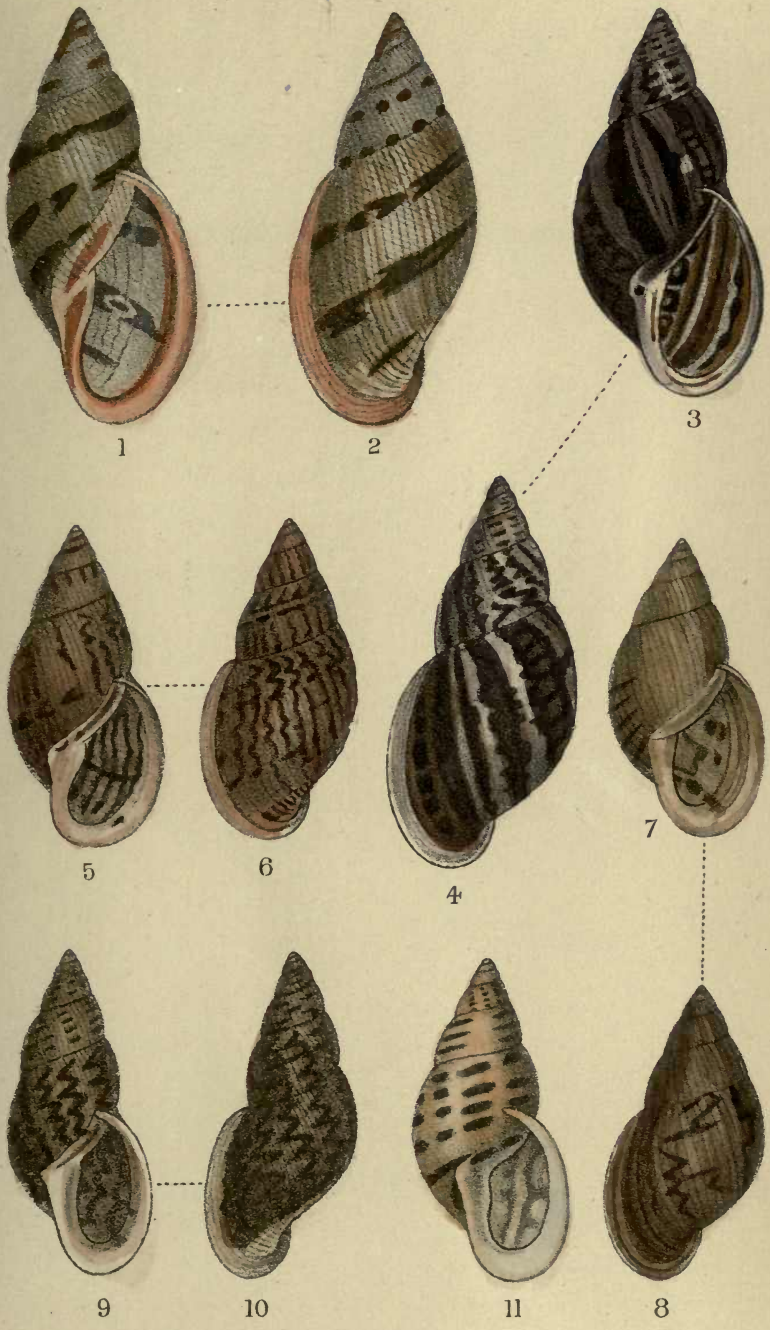
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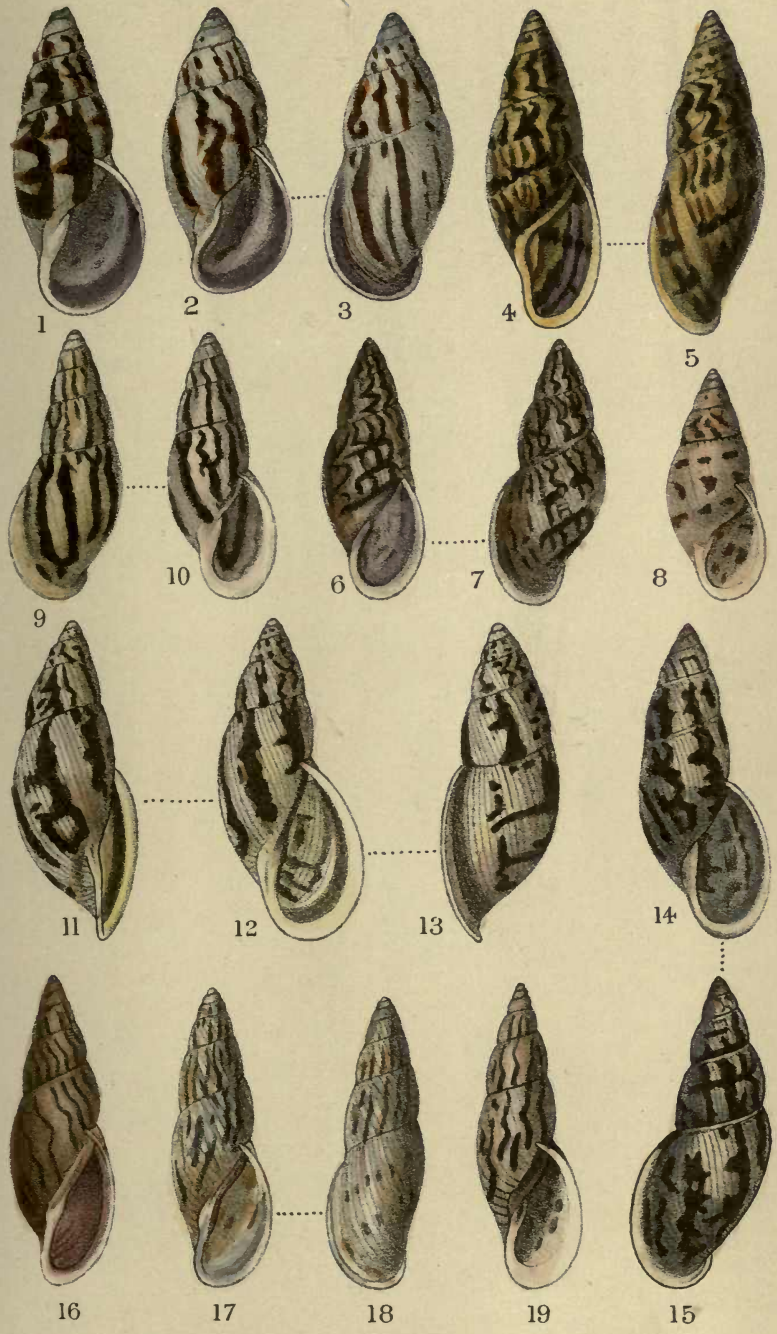
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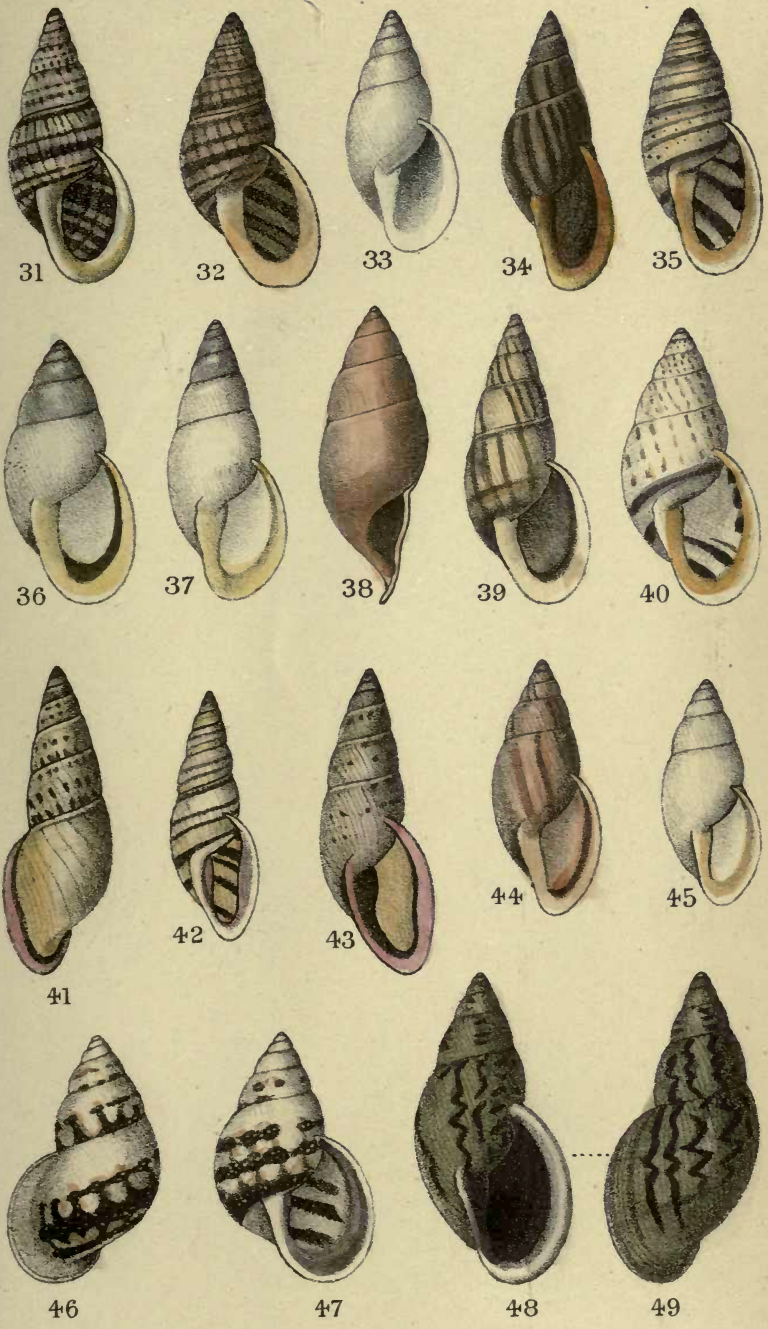
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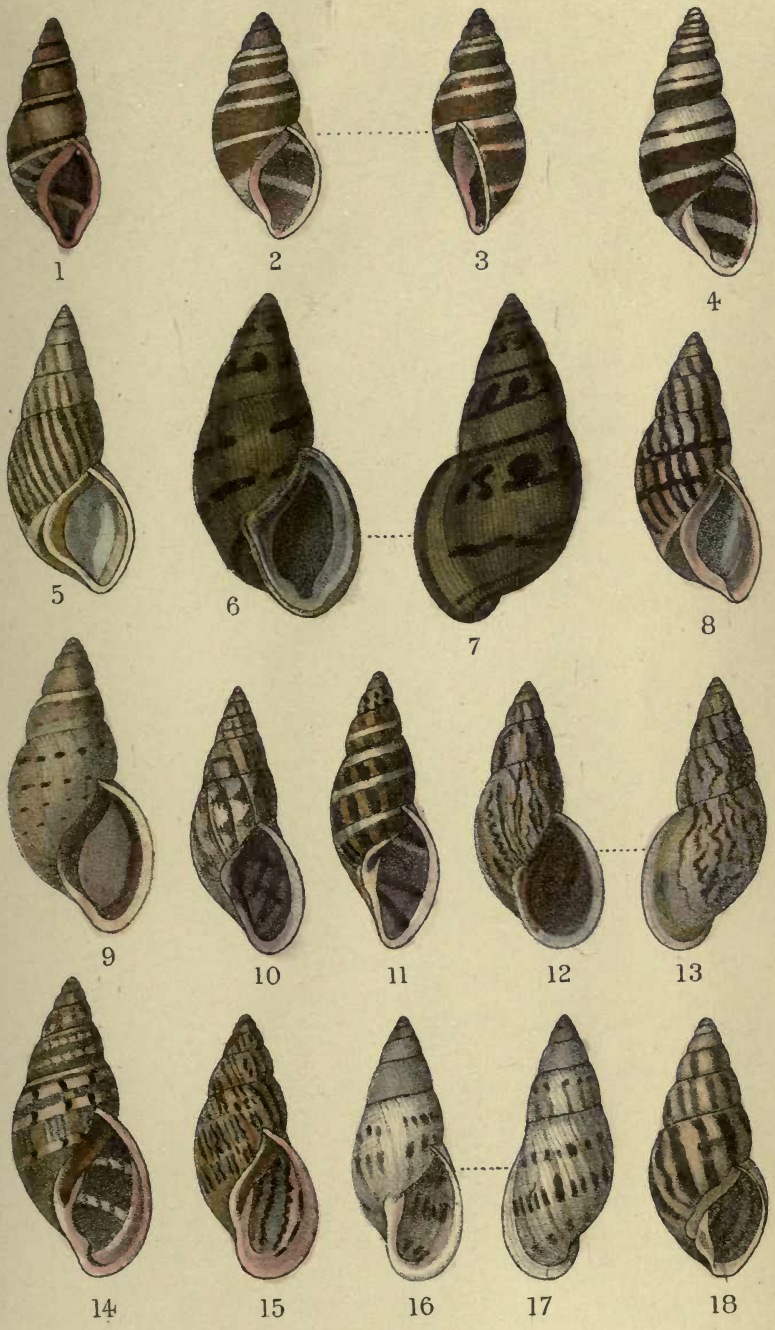
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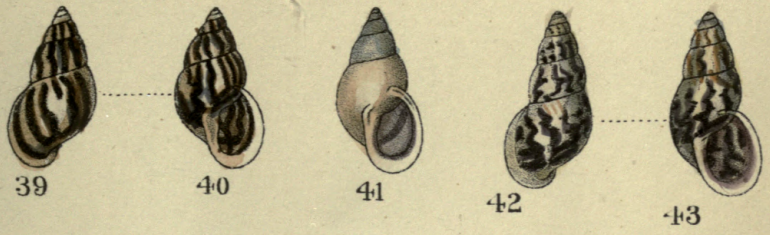

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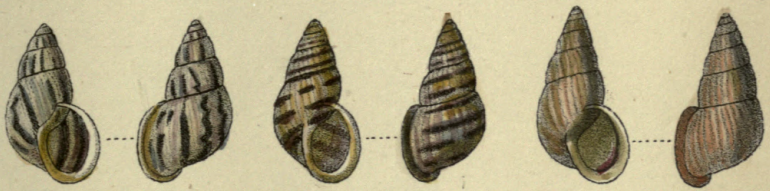

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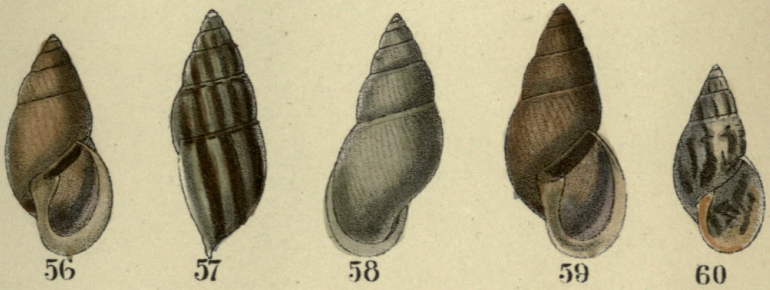

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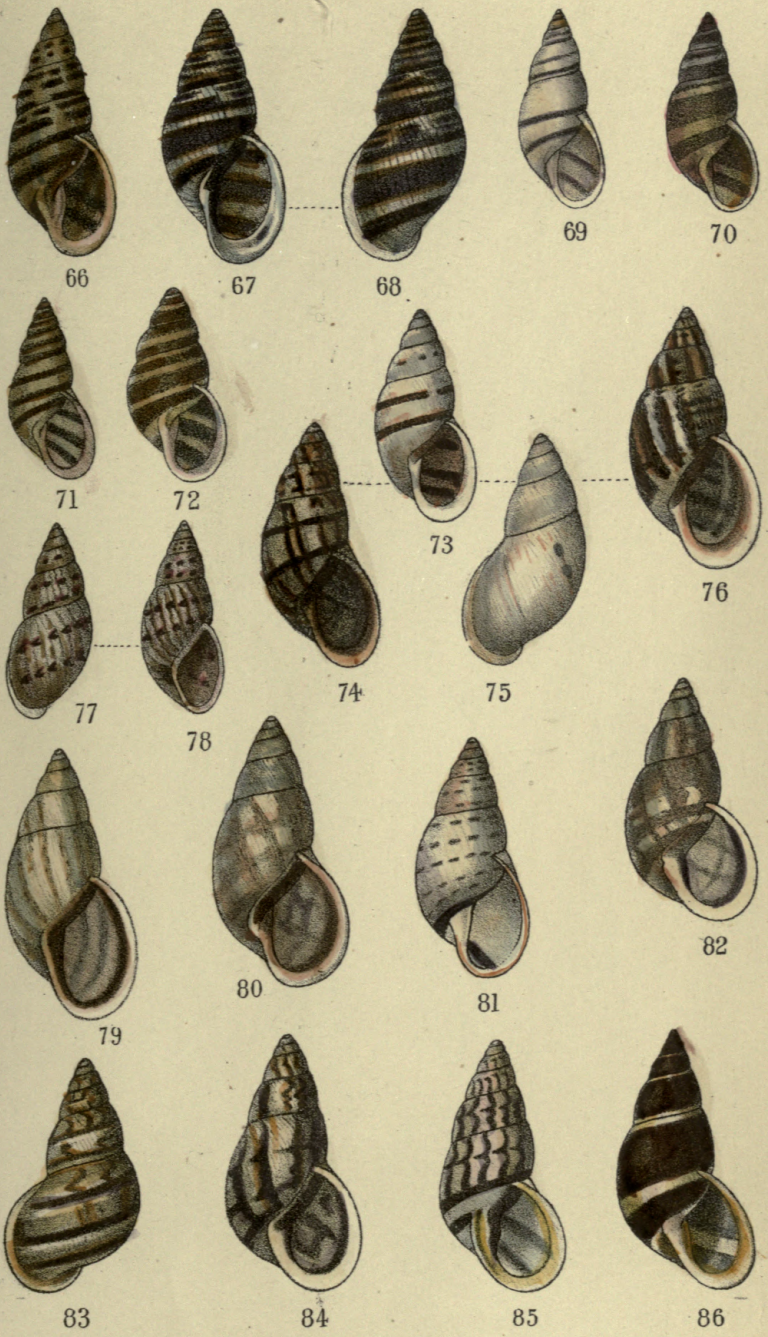
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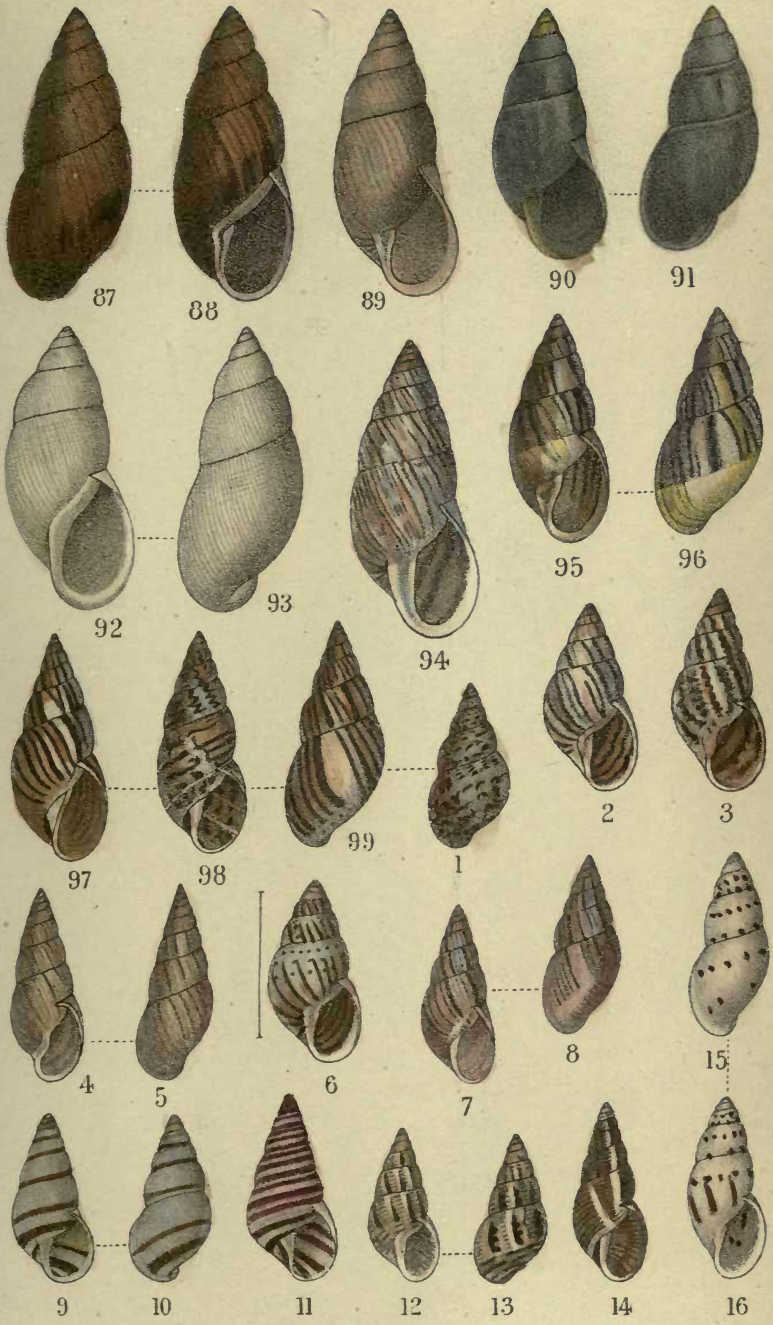
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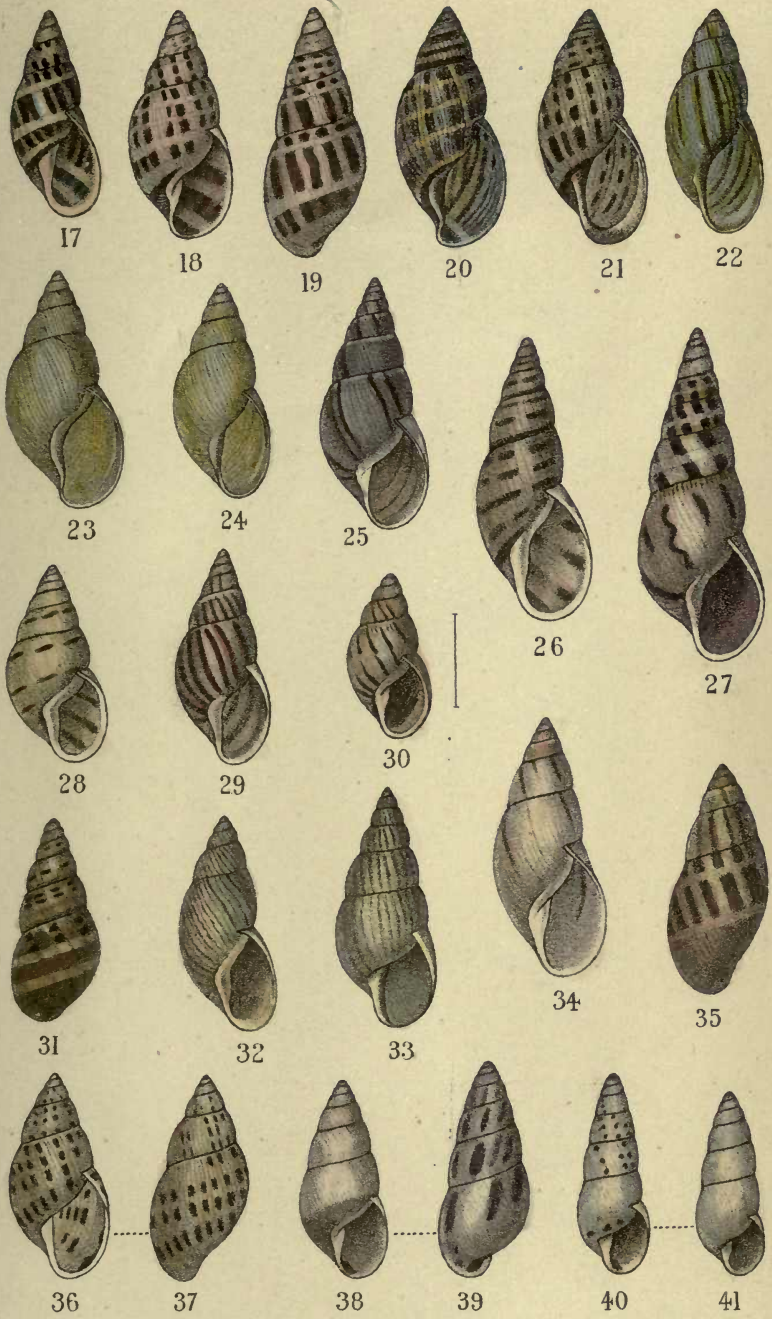
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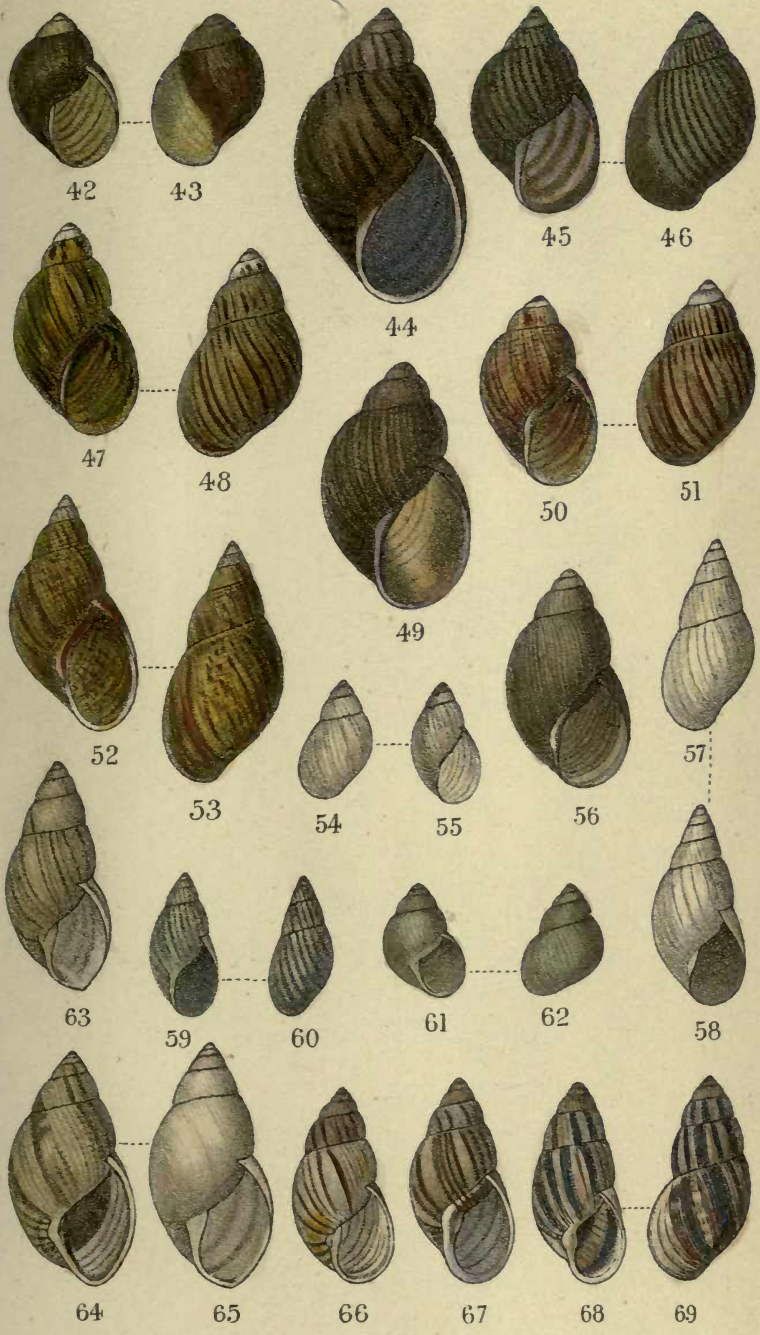
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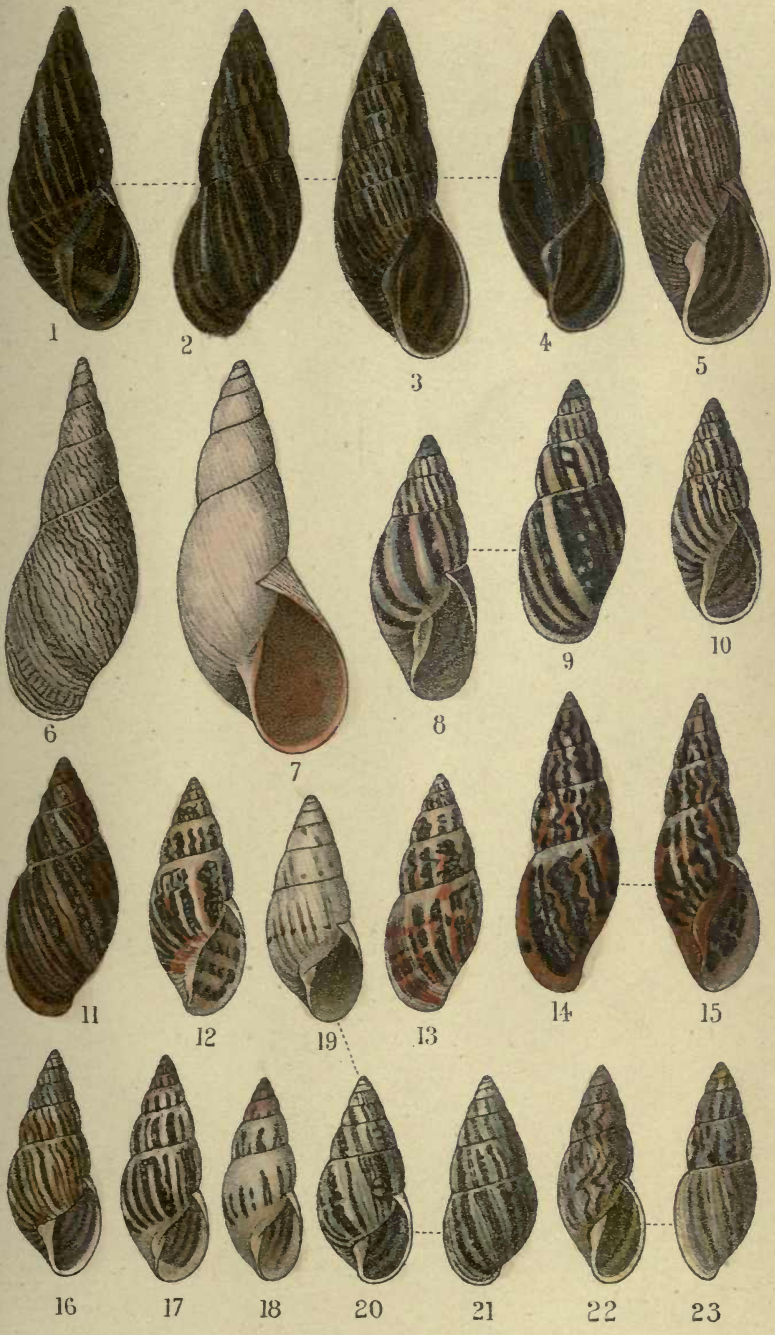
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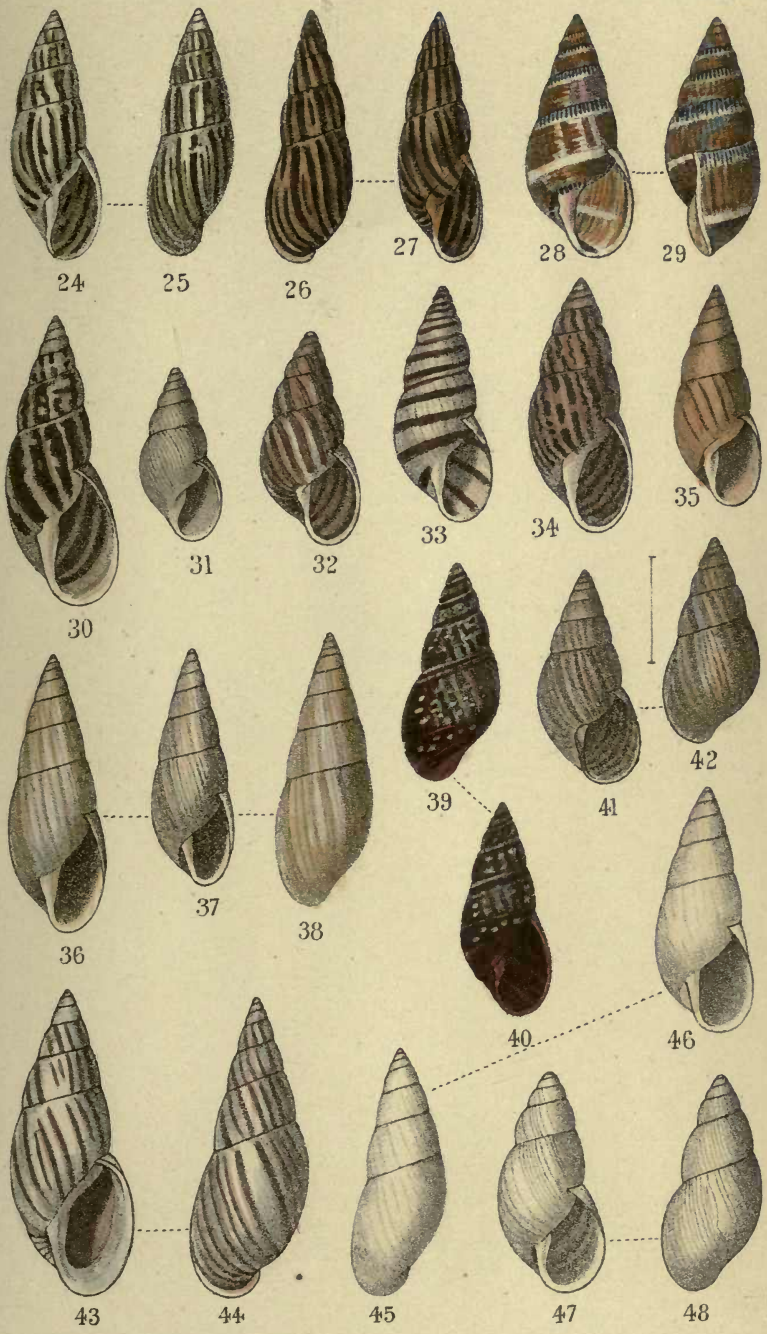
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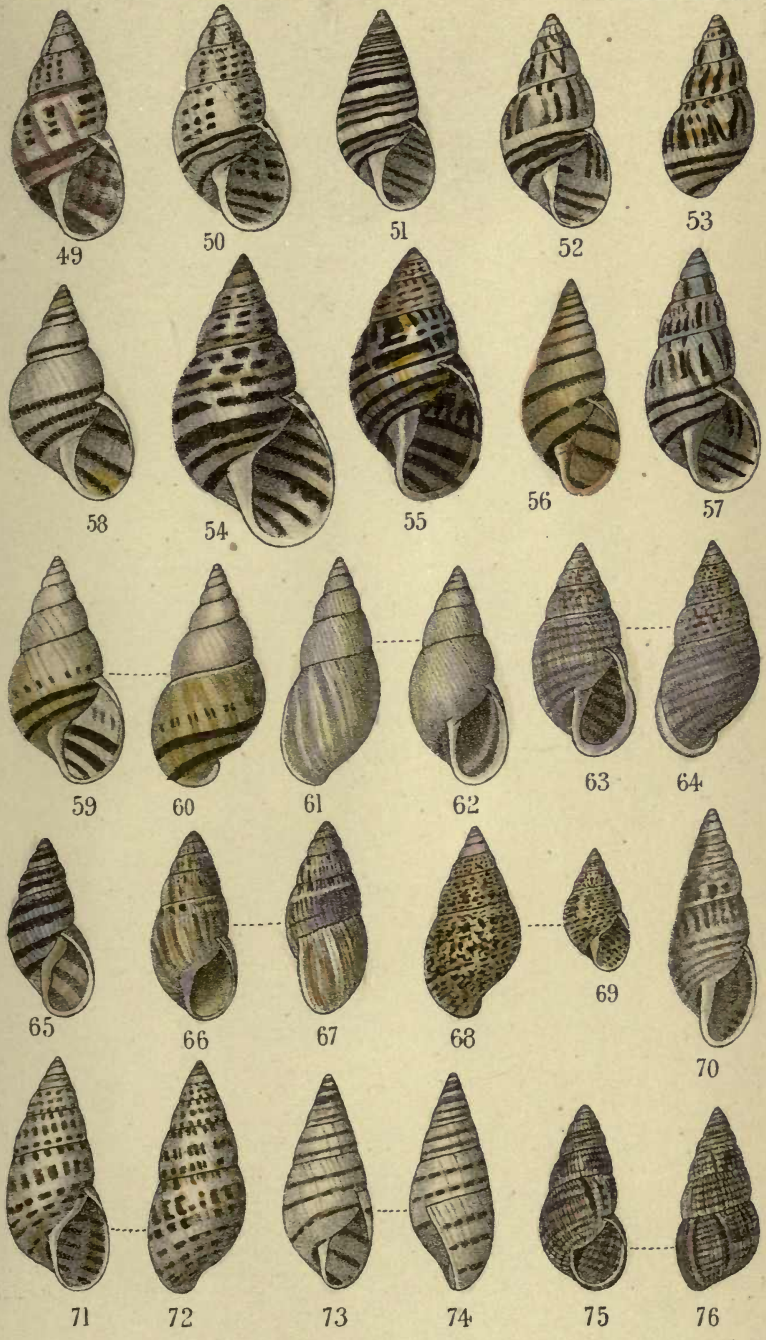
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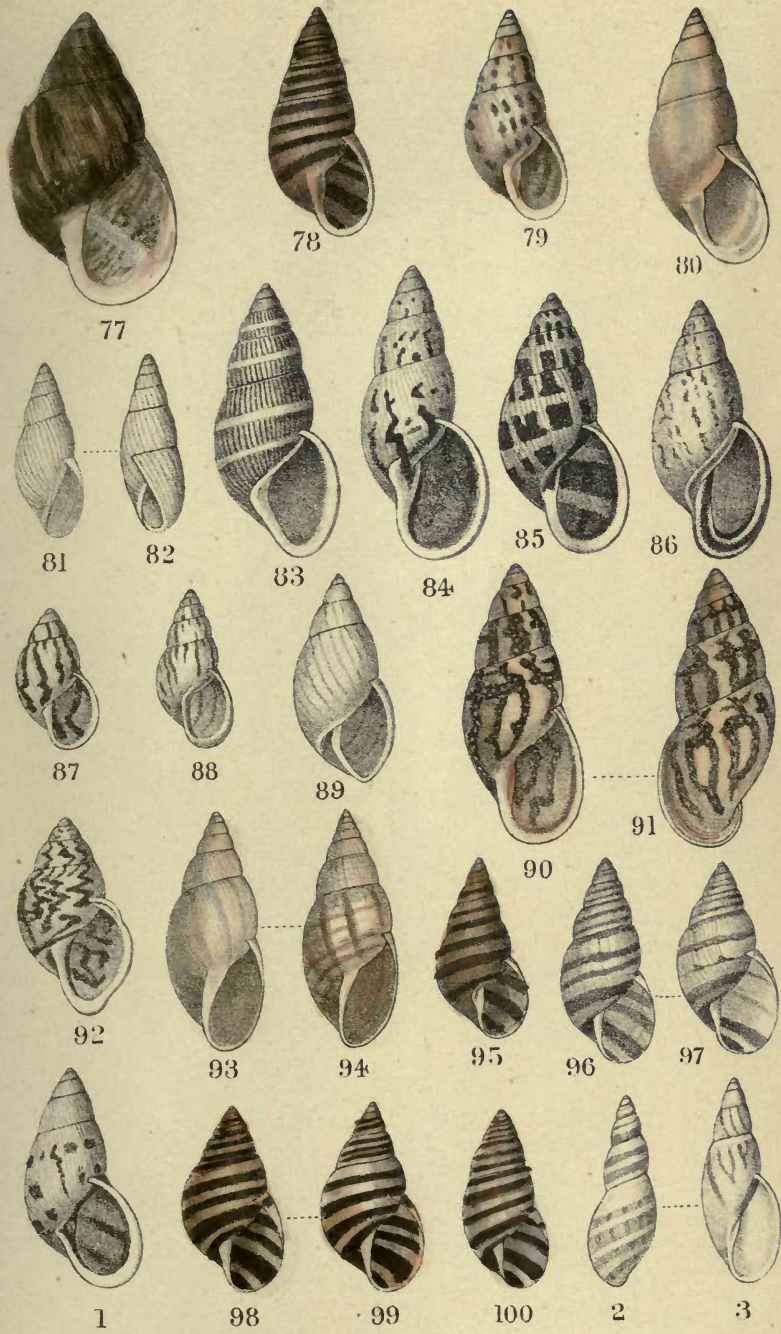
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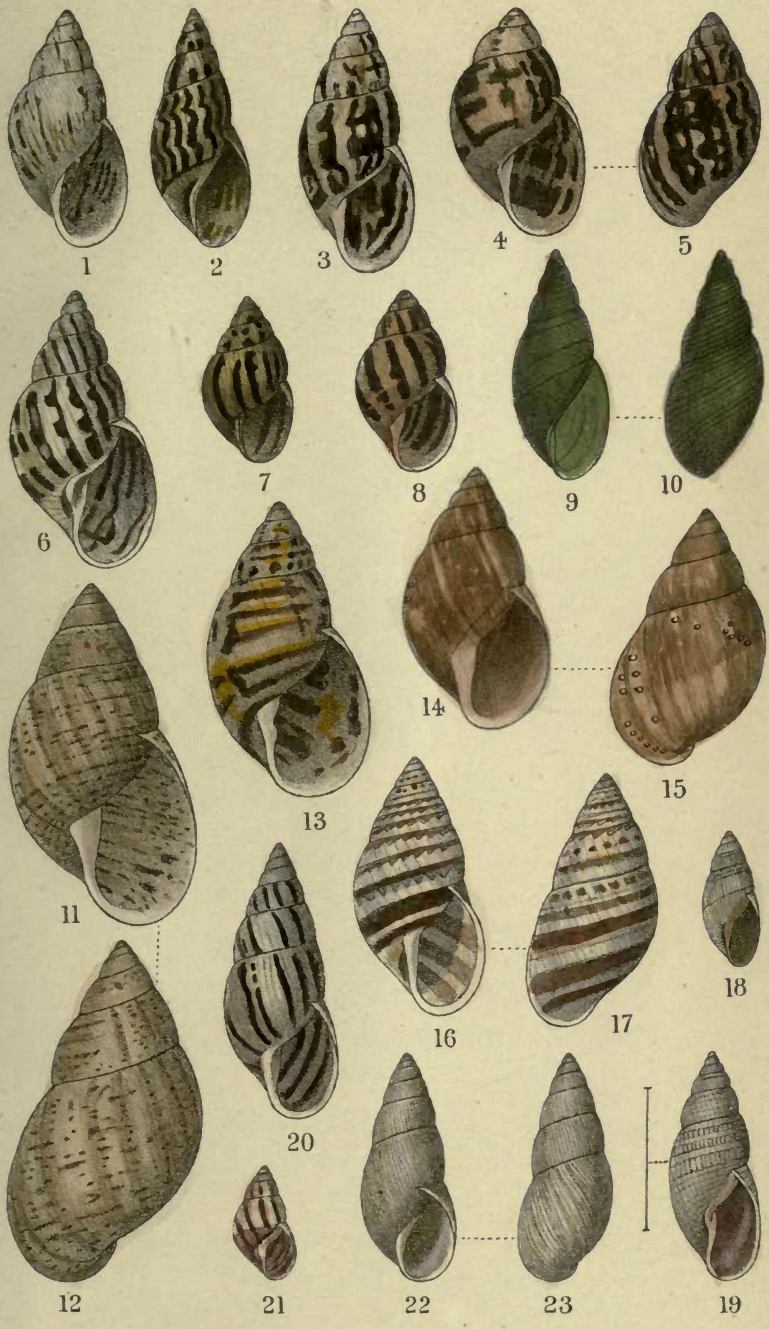
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